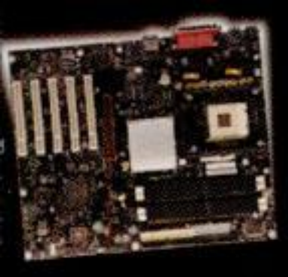

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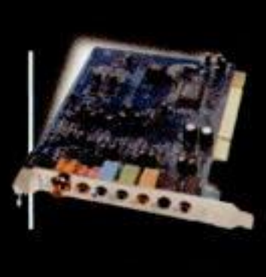

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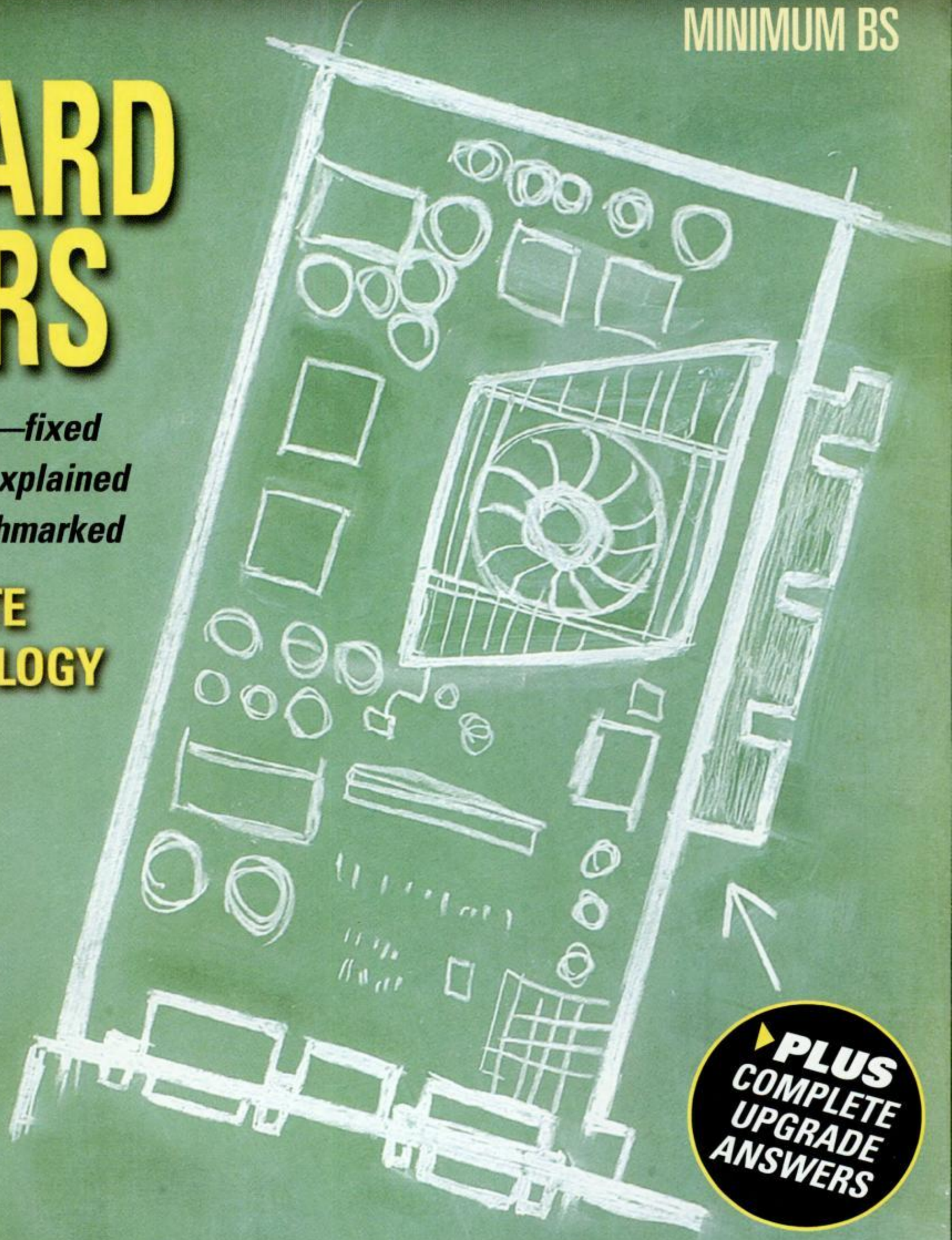

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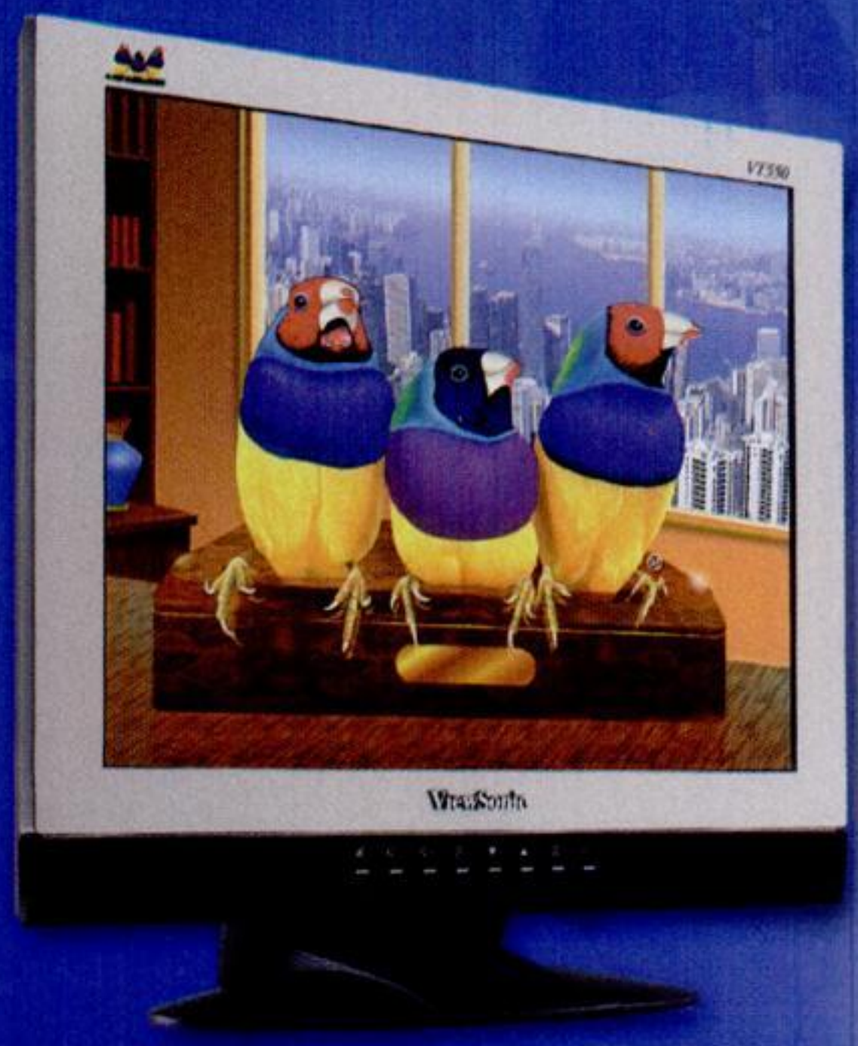

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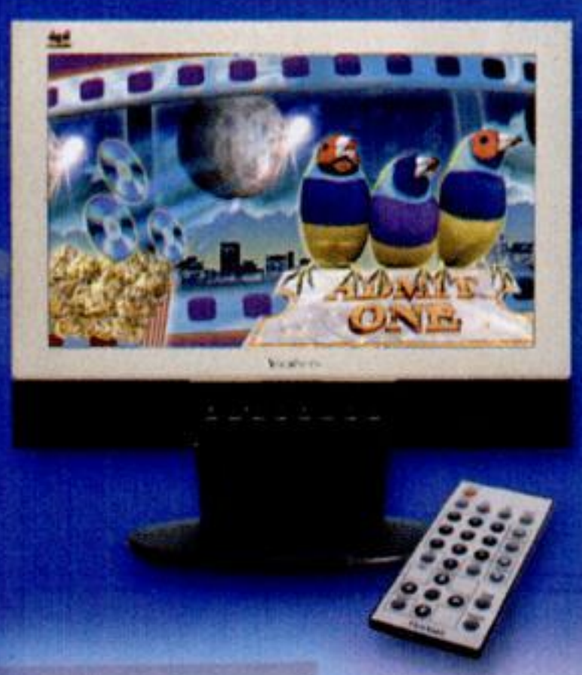

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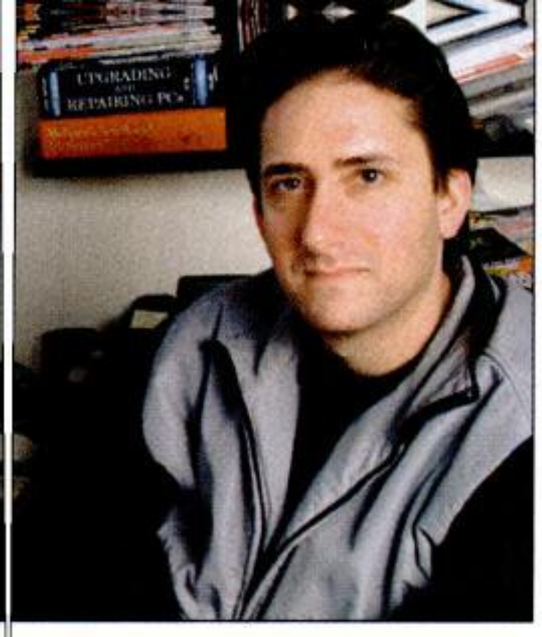

Release Notes

The Day of Programmable Shader Reckoning Approaches

Just got the latest issue of *PC Gamer*, the one with *Half-Life 2* on the cover, and experienced a twitch of PC hardware excitement that I hadn't felt since 1996. Could the Sept 30, 2003 release of *Half-Life 2*—yes, the Valve development team actually committed to a date—signal a new PC renaissance? The "next golden age of upgrading" we've been writing about for the last friggin' 24 months? The new beginning that will return PC enthusiasm to the glory days of *glQuake* and Voodoo graphics, when we were all positively *abuzz* about a newfangled technology called "filtering"?

Hey, I'll be the first to admit that in previous issues, *Maximum PC* has prematurely declared the official beginning of the next hardware revolution. We did it during the GeForce3 launch, and have repeated the optimistic forecasting a few times since. *But now we have a calendar date.* Let me repeat: Sept 30, 2003.

Valve's "proof of concept" screenshots look absolutely amazing, and if *Half-Life 2* can match the storyline, suspense, event scripting, and general gameplay of the original *Half-Life*, it will certainly go down in history as being as important a game as *glQuake*, and perhaps as the *greatest* game of all time.

But, of course, to *Maximum PC*, the imminent release of *Half-Life 2* isn't just about having a mind-blowing, single-player experience until 4 a.m. in the morning. It's also about securing a legitimate game-based benchmark that can give our systems a tiring workout on the old programmable shader heavy bag. And, of course, we're looking forward to the mad rush of upgrading excitement that will occur when millions of PC owners realize their systems don't have the huevos to render the game's next-gen visual effects. Valve says *Half-Life 2* will indeed play on ancient rigs running TNT-level accelerators, and that's just fine with us. We'll be able to run side-by-side "good and bad" screenshots, and show people exactly what *real* hardware can do for them.

Now, if we could just get a *Doom III* release date from Carmack and Co, we'd officially declare a *Maximum PC* holiday.

—JON PHILLIPS

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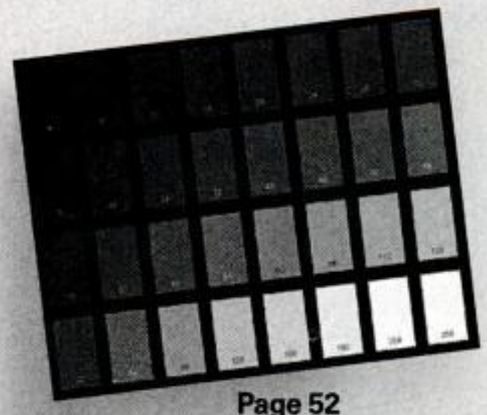

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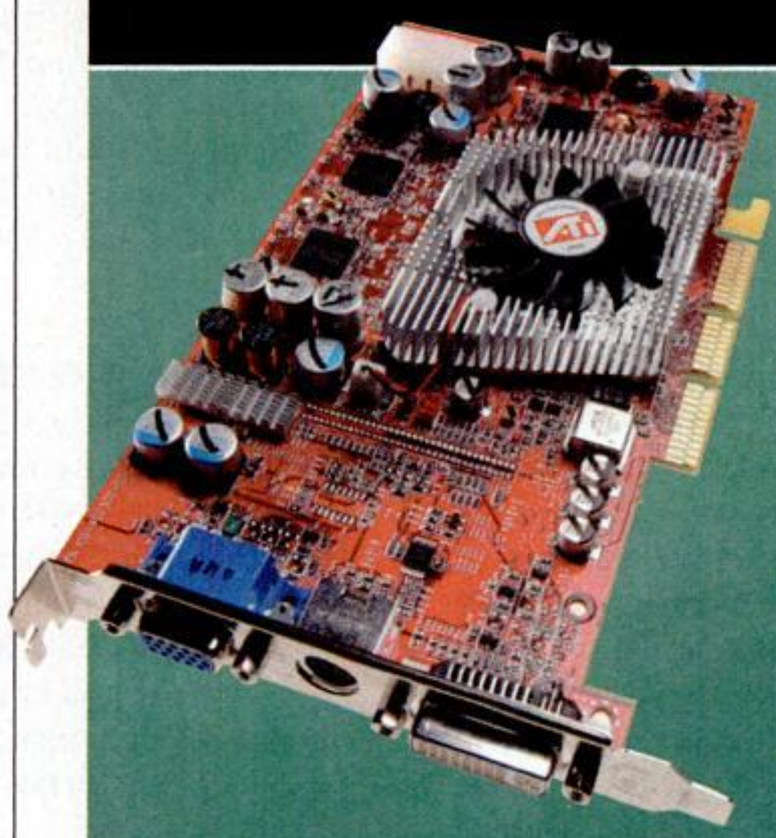

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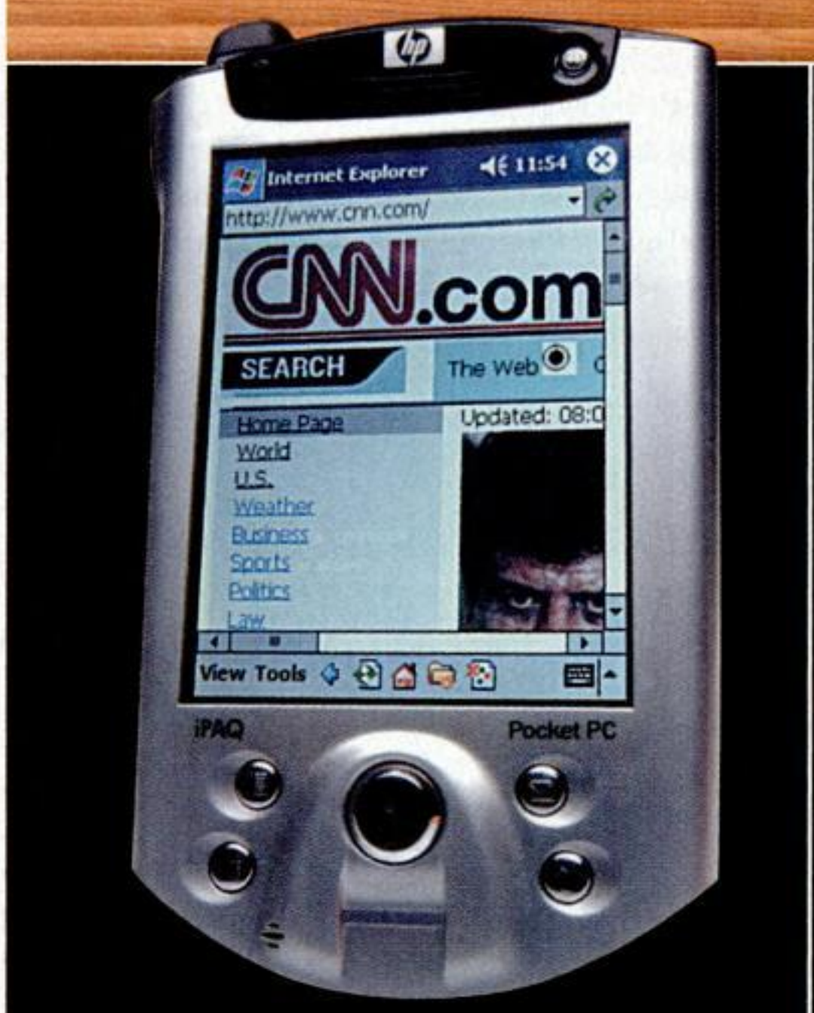

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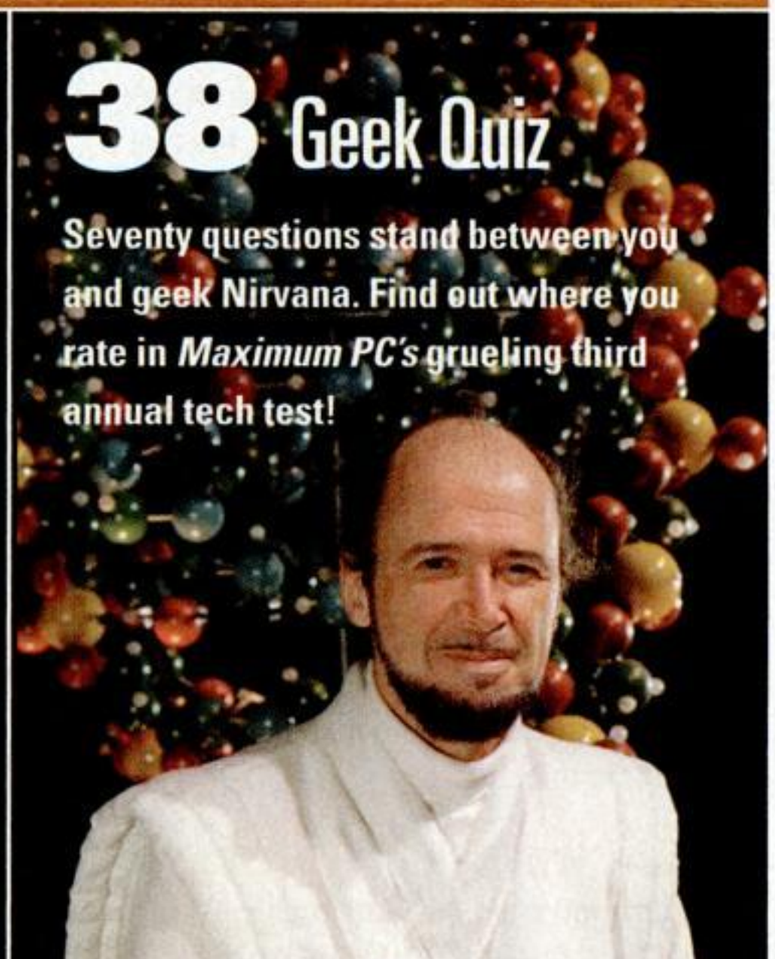

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In/Out

You write, we respond

GORDON ACCEPTS THE PCI CHALLENGE

You guys are awesome and I love every issue, but, damn, you're all a bunch of crybabies when it comes to using internal case space. Yes, the 9800 Pro takes only one slot, and the GeForce FX takes two. But even a half-witted, almost brain dead, and completely tech-challenged 4-year-old would never put another card within two slots of a videocard. I can understand complaining about the GeForce FX's high noise level. But please stop whining about space in the case. Six PCI slots and one AGP slot is common on most mobos. One AGP videocard and one PCI soundcard are all most people will ever run. Everything else is usually built onto the mobo. Hell, can you even think of five PCI cards to put onto a mobo?

—RICHARD LANCASTER

SENIOR EDITOR GORDON MAH UNG REPLIES: I think the problem with the GeForce FX 5800 Ultra isn't that it takes up two slots, but that it takes up two slots and is no faster than a card that takes up only one slot, the ATI Radeon 9800 Pro. If the 5800 Ultra ran twice as fast as the 9800 pro, I don't think anyone would have made a peep about it taking up two mobo slots.

As for your challenge, we could fill the slots with a Pinnacle DV 500 video-capture board, an Audigy 2 soundcard, a Promise ATA/133 controller (for extra hard drive support), an Adaptec 39160 SCSI card, an Intel PRO/1000MT Gigabit Ethernet card, and an ATI TV Wonder Pro TV tuner card. That's six cards. Hopefully, we'd have USB 2.0 integrated into the motherboard, or we'd be in big trouble.

HEY MAX, WHY SO LAX?

I was disappointed by your inclusion of the budget PC upgrades article in your April 2003 issue. I know that many readers write in asking for this type of article, but there are many magazines dedicated to such coverage. I question why these readers are even picking up *Maximum PC*.

Computer Shopper, *PC World*, and *PC Magazine* would all be good choices for people looking for price/performance reviews. Currently, *Maximum PC* is the only "cutting-edge technology," non-Internet magazine I know of. This is why I subscribe only to *Maximum PC*. I do not wish to read about yesterday's technology, or about the low-cost budget parts in circulation.

—PAUL D. PHILLIPS

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Good arguments, Paul, but we have a much more diverse readership than most people would imagine. Not only are many of our readers interested in budget parts, they are interested in *Maximum PC's* specific, expert opinions on budget parts. Sure, they could get the same type of story from the other mags you mentioned, but not the same type of advice. The picks we made were "budget" in the scope of *Maximum PC's* world view, but they would probably be considered decadent by some of the mags you mentioned. In other words, only *Maximum PC* can define budget picks for that special breed known as the *Maximum PC* reader.

Also, the "maximum" in our name refers to "maximum interest level and passion," and not always "maximum performance at any cost." I thank you for your letter. It never hurts to voice one's opinion, and we respect all opinions voiced.

> ***"CAN YOU EVEN THINK OF FIVE PCI CARDS TO PUT ONTO A MOBO?"***

CAN ATA DEVICES REALLY PLAY NICE?

Loved the "30 Steps to PC Perfection" article in the May issue. But you stunned me, and I suspect many others, with your very first suggestion. You recommend putting one hard drive and one optical drive on each IDE channel. I always thought IDE performance was limited to the slowest drive on each channel, which is why I have both my ATA/100 hard drives on the primary channel, and both my optical drives (which are ATA/33) on my secondary channel. Although I understand the logic of having two hard drives on separate channels, wouldn't an ATA/100 or ATA/133 hard drive be limited to legacy ATA performance with the setup you suggest?

—ERIC DERITIS

TECH EDITOR WILL SMITH RESPONDS: You're right, many others were stunned by our suggestion, and they let us know with a lot of e-mails! Nonetheless, when we put together our tips list, it was our understanding that the slowdown bug you mention hadn't been a problem for many generations now—that in today's systems, an IDE device with slower ATA support cannot impede the performance of a device with faster support on the same channel.

So, to settle the question once and for all, we ran some tests. Using the onboard IDE controller of an Intel D850EMV2 motherboard, we placed a Western Digital 1200JB hard drive (ATA/100), and a Lite-On 48x CD-RW drive (ATA/33) on the same channel, and let *HDTach* rip. Regardless of whether the CD-RW was connected, we got the same hard drive test scores. Furthermore, when we ran the same tests while transferring data off the CD-RW drive, we didn't see a substantial performance decrease in our hard drive scores either.

THEY LOCKED ME OUT!

After reading the "30 Steps" article from your May issue, I have a question about my 2GHz Dell Dimension 4550 machine. I went to check if the settings in my BIOS are set the way you suggested, but the BIOS doesn't reveal any of the settings you suggested adjusting. Is this Dell's way of not allowing us to adjust the settings, and is there a way around the problem? Any info would be greatly appreciated.

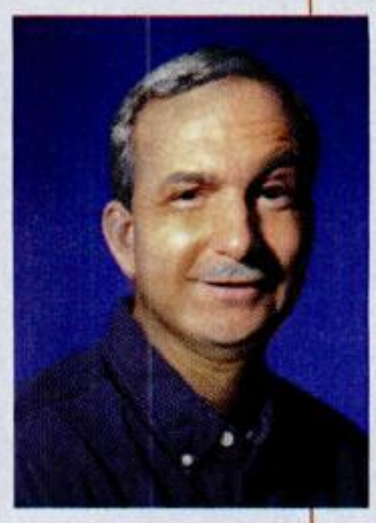
—MIKE PAINTER

Continued on page 8

AND THEIR FAVORITE BAND IS GEEZER

Are Tom Halfhill and Thomas McDonald immortal? Do these guys never age? I have received every issue of *Maximum PC* since it began, and I do not recall their pictures changing—ever. What do these guys eat for breakfast? Can we get some new pictures?

—JOEL R. HOUSMAN



EDITOR-IN-CHIEF JON PHILLIPS REPLIES: It's really a matter of logistics. Tom McDonald lives in the secluded Pine Barrens of New Jersey, and Tom Halfhill works about 23 hours a day in his job as a senior analyst for the *Microprocessor Report*, so it's difficult to get these guys in front of a camera for new photos. But for the sake of argument, let's assume they do age. What might they look like? Hmmm…

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SENIOR EDITOR GORDON MAH UNG REPLIES: In general, most OEMs the size of Dell, IBM, Gateway, and HP lock out some BIOS functionality to protect users from breaking their own machines. While most OEM BIOSes will let you change AGP aperture size or the drive that you boot from, they don't let you get freak-nasty with memory latency and overclocking controls.

We don't have the specific Dimension you own, so it's impossible to pinpoint exactly what you can and cannot adjust. But I do know that BIOS navigation can be a little confusing. I suggest that you reboot, hit F2, and go back into the BIOS, and read the navigation directions on the bottom of the screen. You probably won't find all the settings you'd see in an Abit motherboard BIOS, but that's because the big boys have set those for you already (hopefully).

THE PROOF IS IN THE PITA

Many years before the advent of the Internet, World Wide Web, and bulletin boards, I came up with the acronym PITA. For a while I had to explain it every time I used it. Within weeks after doing so online, I started seeing others use it (along with explanations when requested), and over the years, it has appeared more and more.

Of course it is impossible to prove that I am the originator (and possibly I was not the first), but in my heart I felt I had made my little contribution to the world when I saw it used by your magazine in "Transfer Panel Tussle," April 2003.

I thoroughly enjoy your magazine and have found it very informative and helpful. Keep up the good work.

—WALTER BRAMELD

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Well, there you have it. Unless another person steps forward and puts a claim on "PITA," *Maximum PC* will officially ascribe credit to Walter Brameld, who is himself a *particularly interesting* and *thorough archivist.*

THE PRE-GAME SHOW

In his April column "Garry's End Game," Thomas McDonald stated that the match between Kasparov and Deep Junior was not fair because Kasparov had access to the Deep Junior software. Actually, that was the only way it could be fair. Chess is much more than a simple game of strategy. One of the keys is to know your opponent. Knowing your opponent's play style, and being able to capitalize on it, is an integral part of high-level chess.

The developers of Deep Blue and Deep Junior had access to all of the published grand master games Kasparov has played. They had the opportunity to analyze Kasparov's play style and tune the machine to beat it. Therefore, it would only be fair for Kasparov to be able to do the same. In fact, one could say that Deep Blue's match against Kasparov was completely unfair, because Kasparov didn't have the same access to information that Deep Blue had.

—DAVID HSU

DOIN' RIGHT BY RDRAM

I have been reading *Maximum PC* since the Dream Machine 2000 issue, and I've always been impressed by one fact: You guys consistently go out of your way to benchmark CPUs with the best chipset available. Time and again, I go to various web sites to see how they rate the performance of the newest proc or mobo, and there's usually a common factor: They use DDR with a 3.06GHz P4. Why? Gee, maybe because they think that people don't care about real performance anymore? Or maybe because they feel that the "industry standard" needs a push in the DDR direction?

Some might think that the DDR compromise is merely a small annoyance, or even something that saves money at the sacrifice of a few frames per second in the hottest games. Is this the attitude that helped usher in the era of 3D gaming? I think not! I hearken back to the early days of Deathmatch when I was but a wee

THEY'RE NOT HONDA CIVICS!

I found the May issue containing "essential case-modding accessories" to be quite disconcerting. I am one of the few people who believe modding is a means of expressing your own originality and style. Understandably, not everyone has the time to design and build his own case, and would rather find a simple way to spruce it up. But we are *Maximum PC* readers. We take PCs to the extreme, and filling a beige box with chrome switches, lights, and neon items is not extreme. It's downright wacky like those Honda Civics with big body kits and flashy paint jobs. My point is that I don't want people building a bad reputation for case modders, and I'll take any chance I get to set people straight on this. Because, man, those Hondas are ugly. (I've sent you guys this attached picture once already, but it's back again just so you'll know I'm not one of the regular case-modding groupies.)

—ALEX WILEY

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Point well made, Alex. But judging from your awesome-looking case, we'll have to assume that you are a groupie, albeit of a different order!

COMING NEXT MONTH IN THE PROUD-AS-A-BLUE-RIBBON-PIG JULY ISSUE OF MAXIMUM PC

The OVERCLOCKING Handbook

Whether you're a complete beginner or an old-time practitioner of the dark arts, our handbook will give you the info you need to boost your CPU speed dramatically *and* safely. Extra megahertz are just around the corner!

DSL Down-and-Dirty

We have *had it* with namby-pamby DSL guides written for rank beginners. So we decided to commission our own hardcore DSL FAQ. We give you answers to your most pressing DSL hardware questions—loaded with tech explanations, which is just how we like it.

CRT Showdown: Inches for Grinches

So you're a penny-pincher—whatever. It doesn't mean you can't buy a perfectly respectable 21-inch CRT that'll give you a *way* better gaming experience than your current monitor. We lab-test and review the most compelling big-and-cheapies available.

Patriotic PCs

The results are in, and we've got a parade of inspired patriotic case mods to show you. It's *Maximum PC*'s own little Fourth of July celebration—join us next month!

And remember, readers, all topics are subject to change if one of your favorite technology companies gives us a must-see coverage opportunity.

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lad. Sheer performance was king, and watered-down imitations were quickly dispatched with a rail-gun shot to the head. To what depths have we sunk when 85 percent of all reviews are performed with hardware that is merely second best? So, once again, I thank the editors and staff of *MPC* for their undying devotion to the cause of performance.

—TIMOTHY ANDREWS

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: Lest their be any confusion among the under-informed, Timothy is giving us props for having always tested the Pentium 4 with RDRAM, which has been the best-performing (and most-expensive) memory for the P4 platform. Of course, Intel is just beginning a transition to dual-channel DDR as its "performance memory of choice," and, as in the past, we will conduct future head-to-head CPU showdowns with each CPU's best-performing chipset and memory.

LET'S DO MULTI-MON SUPPORT RIGHT!

I continue to see articles on the impracticality of flat panels in gaming rigs because of high native resolutions and other incompatibilities. Personally, I think the real problem is sloppy implementation of multiple-monitor support in operating systems (I won't name names), and in actual PC games. Why can't we have greater control over the primary display? Or games that let you configure which display they start on? Or, God forbid, the ability to have two displays, or to keep both displays when a game starts, so you can have open a walkthrough site or your cheats?

Please help a gamer who needs a non-retina burning flat panel to ease his poor orbs, but still needs to frag people and crush a civilization or two now and then. Can the power-hitters at *Maximum PC* pressure the industry for better multi-monitor support?

—SAM ROSSI JR.

EDITOR-IN-CHIEF JON PHILLIPS REPLIES: The "industry" always pleads, "There's not a large enough installed base of multi-mon users to justify the development!" But believe me, we frequently bring up multi-mon support when we meet with game companies, video-card vendors, and Microsoft.

FREE EXPRESSION ISN'T FREE

I am Senior Airman, and am currently deployed in support of Operation Iraqi Freedom. I'm also an avid PC builder and gamer. I'm writing to let you know how much I appreciate your integrity by not giving in to the pressure to ban things patriotic in your magazine. It's a shame when Americans use their right of free speech to tread on the graves of soldiers, sailors, airmen, and marines by saying the flag isn't politically correct. But I agree with [Editor-in-Chief Jon Phillips] that the "good fight" is to protect their right to do just that, just as others have fought before us for the same rights.

Every PC gamer needs to ask himself when playing *Battlefield 1942*, *Medal of Honor*, and the host of other military simulation games, why soldiers go through those horrible but necessary situations. Well, if you can't figure it out, try reading the Bill of Rights, and the Constitution of the United States. When you look at your pretty PC and your beautiful free country, remember where they came from, and remember the cost. Remember the cost.

—DAVID CABELL

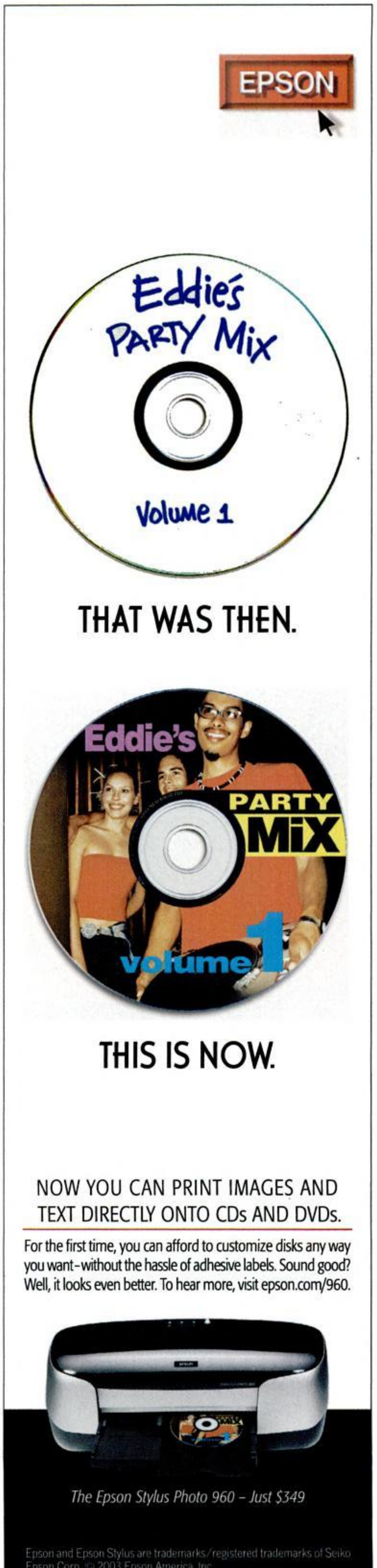
CUT, COPY, PASTE

➤ In our May issue modding feature, we identified one of the products as the Antec SmartBlue power supply and gave it a power rating of 480 watts. We mixed up the SmartBlue and the TrueBlue products. The SmartBlue has a rating of just 350 watts, while the TrueBlue has a rating of 480 watts. The SmartBlue costs $65, but the TrueBlue costs $125, according to Antec's web site: www.antec-inc.com.

➤ The URL for *Ad-Aware* is www.lavasoftusa.com not www.lavasoft.com

➤ The "Best of the Best" list in the May issue incorrectly listed the top videocard as being the Hercules 3D Prophet 9800 Pro when it should have said ATI Radeon 9800 Pro.

LETTERS POLICY: *MAXIMUM PC* invites your thoughts and comments. Send them to **input@maximumpc.com**. Please include your full name, town, and telephone number, and limit your letter to 300 words. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.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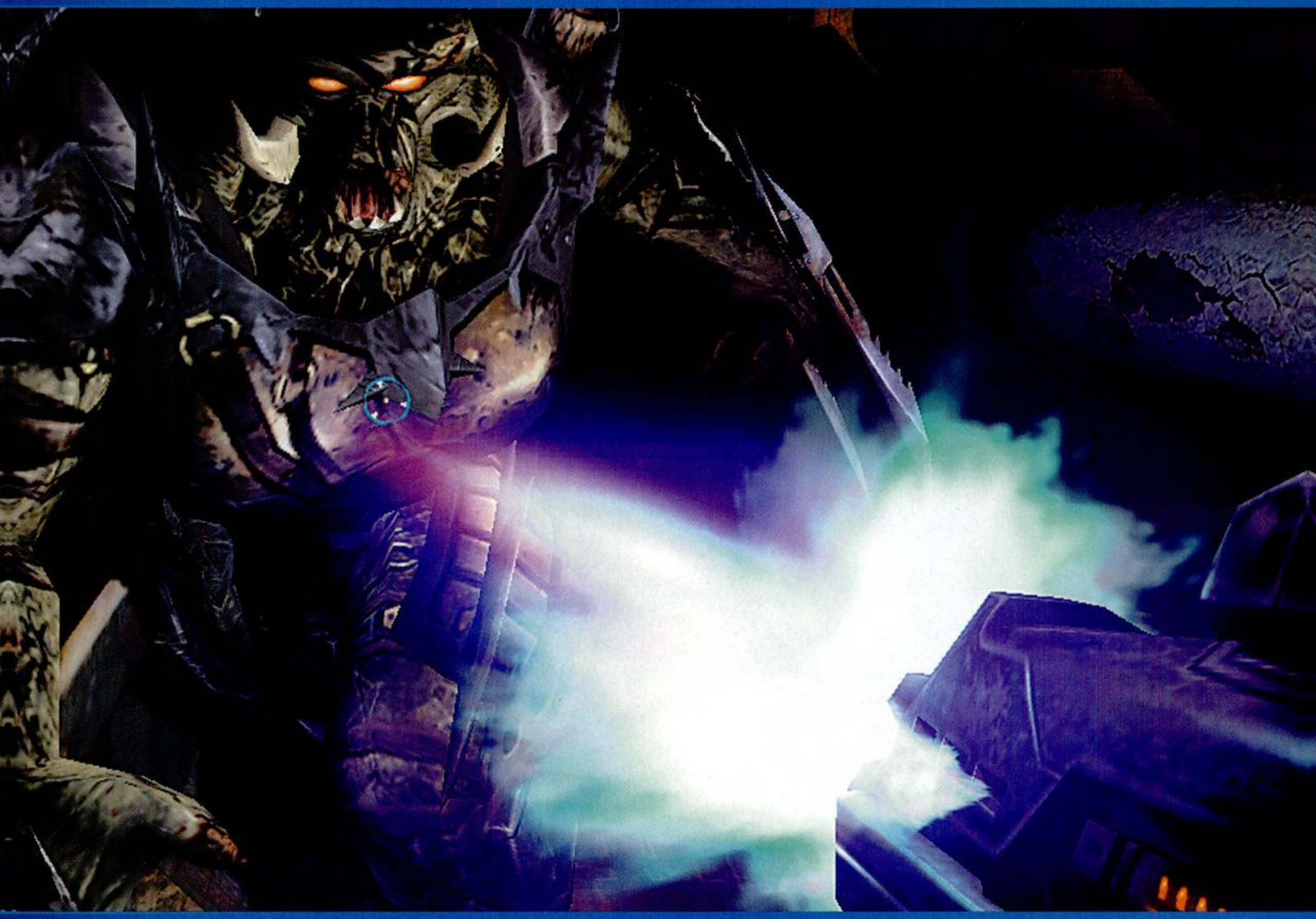

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Quick Start

The beginning of the magazine, where articles are small

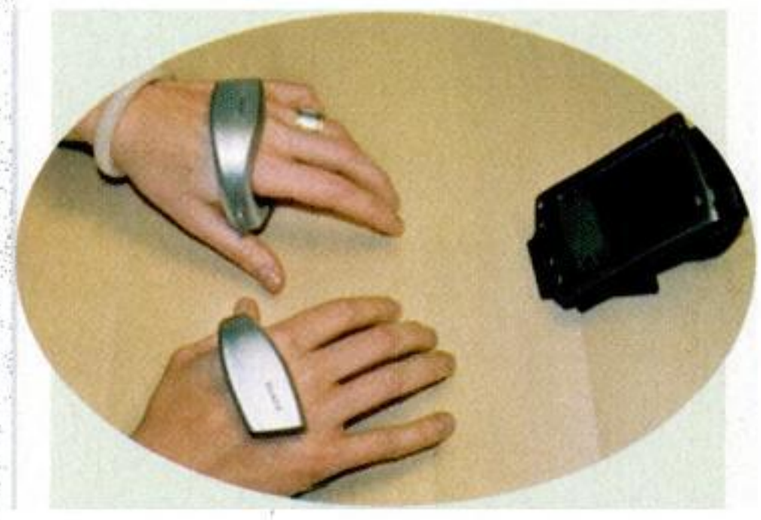
'Keybowls' and Other Peripheral Visions

A few innovative manufacturers would appreciate your input

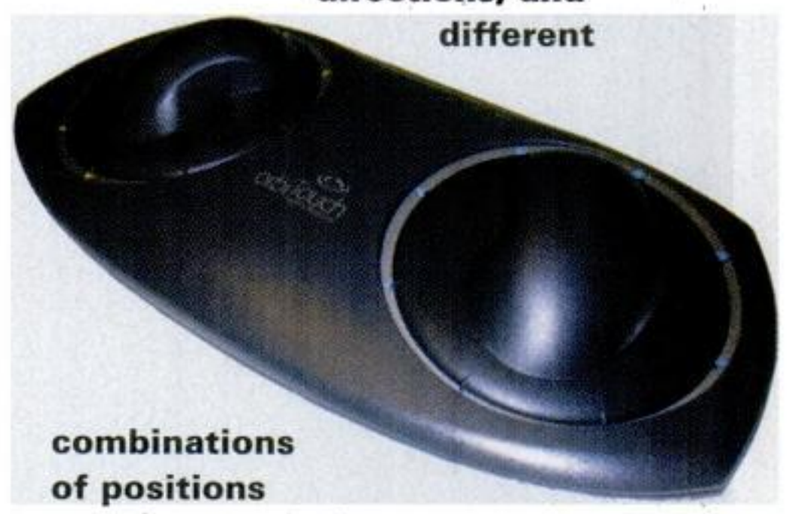
The *American Heritage Dictionary* defines ergonomics as "the applied science of equipment design...intended to maximize productivity by reducing operator fatigue and discomfort." What's surprising is the way some folks are applying their science to PC input devices. But, hey, maybe a design that's more than 125 years old is due for an overhaul.

It's a keyboard. It's a mouse. It's... the Combimouse! Yes, not only can the split-key Combimouse be angled to increase your personal typing pleasure, but the right side includes an optical component, so you don't have to lift your hands from the keyboard in order to mouse around the house. The movable half features a contact switch that enables "mouse mode" so accidental movements, twitches, and uncontrollable tics won't spoil your work. www.combimouse.com

On their own, the Senseboard devices look like jet-skis for mice. But slip them over your hands, and you've got another keyboard-less virtual keyboard. The sensors record the motion of your fingers and thumb, and after a 5-to-10 minute calibration period, you'll be able to type as fast as you would on a normal keyboard, or so says the product information. The folks at Senseboard also went the extra mile, assuring us that the "pause function" would allow us to "eat, drink, or scratch...without creating unwanted letters and symblols [sic]." www.senseboard.com



At first glance, the Orbitouch might seem kind of extreme. Two sliding pads move in eight different directions, and combinations of positions produce the full range of keys that a traditional keyboard provides. Yes, seriously. But it's not just for thrillseekers looking for their next high. Orbitouch claims that its keyboard can be used by those who have disabilities that prevent them from using their fingers. That still doesn't explain the "keybowl" URL. Wasn't that from *The Ice Storm*? www.keybowl.com



The secret to the freaky, compact FrogPad is what's called modal typing (that's what you're doing when you press Caps Lock to go from lowercase "mode" to uppercase "mode"). Each FrogPad key has four key modes, with the most common letters placed in the most accessible locations. And with only one hand required for use, well, let's just say that the chat room folks are going to love this one. www.frogpad.com

SafeType takes a hard line in promoting its unique vertical keyboard: "Ergonomic keyboards can still hurt you. Only SafeType™ is Orthopedically Neutral™." And this horror-movie tactic seems fitting for such an elaborate, almost sinister-looking device. At the SafeType web site, you'll find out how vertical design eliminates the evils of repetitive stress that other "ergonomic" designs do not, and get scared into buying a vert-board at the same time. The site does caution all users, however, to take appropriate breaks. Roger that! www.safetype.com

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The Wi-Fi Family Grows

Please join us in welcoming two new 802s

There are already scads of 802.11a, 802.11b, and 802.11g LAN products littering store shelves across the country, and many big-city streets offer prime hunting grounds for 802.11 LAN sniffing. But, make no mistake, Wi-Fi coverage is far from universal—even in densely populated, tech-friendly areas like the San Francisco Bay Area, where *Maximum PC* is based. The 802.16 standard is designed to fix that.

802.16a describes a technology intended for city-wide wireless networks, with a maximum throughput of around 70Mbps, and a range of about 31 miles. As is the case with other 802.11-based technologies, all the users on a single 802.16 node would share bandwidth. But unlike current wireless broadband technologies, 802.16 doesn't require a clear line of sight between sender and receiver.

We initially expect to see 802.16 used as a broadband replacement for the commercial and free wireless "hot spots" found in large cities. Currently, public 802.11 hot spots require the installation of a wired infrastructure, which is expensive. But by providing wireless 802.11 access to the Internet via a single 802.16 connection, wireless providers can save a ton of money on modem and cabling expenses, and provide more consistent coverage to an entire city.

Just don't expect to sign up for 802.16-based services anytime soon. Bandwidth topping out at 70Mbps isn't much to share among an entire city of users. We expect to see the initial "a" version of 802.16 used exclusively by telecoms and network providers, with future revisions providing more bandwidth and support for more users.

The other new 802 spec is called 802.11n. Its proponents want to improve the efficiency of the wireless signal, so that more of a wireless link's maximum theoretical bandwidth is used for data, instead of features like error correction. The 802.11n team hopes to bump the maximum throughput of your wireless LAN to somewhere between 108Mbps and 320Mbps. The bad news is that 802.11n is just a paper technology right now. The team doesn't expect to have a final spec until 2005 or 2006.

EA and nVidia to Make Lovey-Dovey

Will 'exclusive content' leave ATI owners fuming?

Electronic Arts and nVidia have formed an alliance to create "exclusive content" in EA games for people running nVidia videocards. The program, called "The Way It's Meant To Be Played," caused a stir on Internet message boards: Will ATI card owners be denied specific levels in specific games? Will certain visual effects just not run on ATI cards? Will Atinistas be barred from playing EA titles entirely?

As dramatized in this screenshot from EA's *Battlefield 1942*, the exclusive content deal nVidia has struck with EA is the latest salvo in a gruesome battle with ATI.

Although EA and nVidia have been somewhat tight-lipped about the program, nVidia did state that "the nVidia and EA Games partnership will ensure that EA games run and look best on nVidia hardware."

nVidia also reported that "we are working closely with EA's worldwide studios to implement advanced cinematic visual effects in games such as *Madden 2004*, *Tiger Woods 2004*, and *Battlefield 1942*."

FUN-SIZE NEWS

3GHz P4 "Anomaly" No Longer Anomalous

For a week-long period, Intel halted shipments of its new 3GHz P4 with 800MHz bus support while it sorted out an "anomaly." The company said a few CPUs in its labs sent "incorrect information" to their host systems during routine validation testing, so Intel created a BIOS update to prevent the problem from happening again. Intel said although it is highly unlikely that any end user would ever have seen the problem, the company decided to hold shipments until the CPU was de-anomalized.

LandmarkTheaters Goes Digital with Microsoft

Microsoft and Landmark Theaters announced a deal in which Microsoft will equip all 177 screens in the chain's 53 U.S. theaters with digital projection systems. The system will enable independent producers and distributors to strip out the cost of mastering and delivering celluloid reels. The projection system will use Microsoft's home-brewed multimedia codec, Windows Media 9, which the company is touting as the next-generation standard for digital video distribution.

Dell Introduces PC Recycling Program

If you're like us, you've got the carcasses of many once-proud PCs gathering dust in the garage. You can't just toss them in the trash, and most hauling companies charge a steep price to dispose of monitors, due to their hazardous elements. But for $15 for every 50 pounds of equipment, Dell Computers will come to your house and whisk away all your PC junk—monitors included. Go to **www.dell4me.com/recycling** for details.

Serial ATA, Meet Serial Attached SCSI

The SCSI Trade Association is currently busy at work putting the finishing touches on the specification for the next generation Serial Attached SCSI (SAS) drive interface. You'd think they might, at this point, start lobbing water balloons in the direction of the Serial ATA (SATA) offices, but just the opposite is true. The specification is being designed to provide hardware compatibility with SATA drives, so that SAS and SATA drives can be used together or even interchanged. It may be a long time before the technology comes to home PCs, but it sure is nice to see folks getting along.

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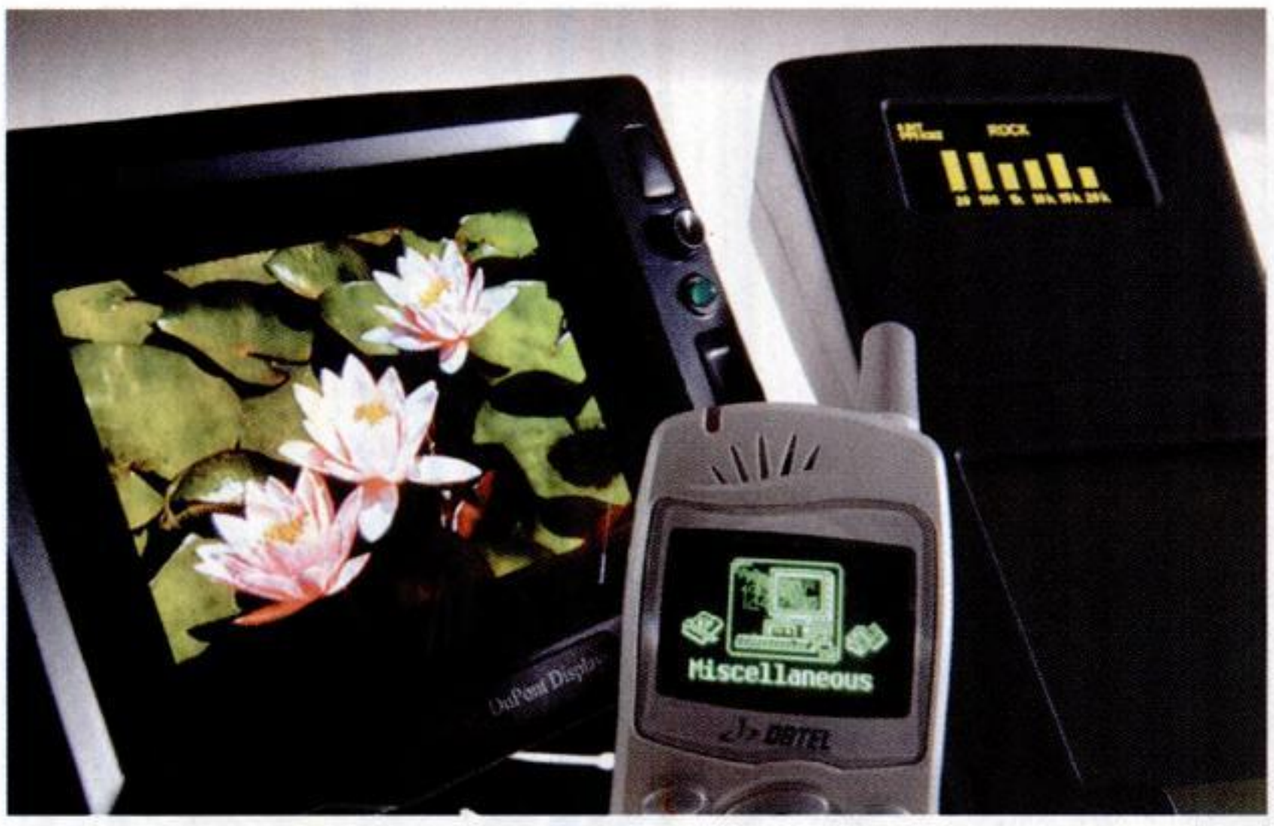
Let There Be Olight

Why OLED technology could put LCDs out of business

If the Duponts and Kodaks of the world have their say, we'll all eventually be swimming in OLED displays—and LCD and plasma screens will be obsolete. Both mega-companies are developing "organic light emitting diodes," and this month we sat down with Dupont to learn more about its specific implementation, branded as Olight.

Here's how it works: First you take a thin layer of organic material (basically the same stuff found in fireflies, but produced in a lab), and then sandwich a very small amount between two electrical contact layers. Apply a modest voltage to the sandwich, and voila, you have Olight. At first glance, Olight displays might look like LCDs, but they promise key improvements:



The Olight displays we saw in person were bright and had great off-axis viewing.

➤ Because they're emissive displays (i.e., they generate their own light), OLEDs don't require a backlight like LCDs do. Thus, they're thinner and lighter.

➤ No backlight means less power consumption, so portable devices running OLEDs will offer much better battery life.

➤ LCDs can be difficult to view at off angles, but OLEDs can be viewed from *any* angle (we tested this claim in person—it's true).

➤ Today's LCDs switch colors at about 25 milliseconds, but OLEDs will switch at about 25 *nanoseconds*.

➤ Because their subpixels will be printed on glass by extremely complex and expensive inkjet printers, desktop OLEDs should offer extremely fine pixel pitches. Today's LCDs offer pitches of about 0.50mm, but OLEDs are targeted at around 0.20mm.

The Olight displays pictured here are all working samples, but they're small, passive-matrix displays, and only hint at a bright and bold OLED future. Dupont says that by 2004, OLED will go active-matrix, and these brighter, more high-definition iterations will appear in desktop flat-panels. The next stop on the road map will be in 2006 or 2007, when OLEDs are printed on plastic, which is eminently formable compared with glass (you might even see flashy OLED logos sewn into clothing!).

But the pinnacle of OLED technology could be achieved by 2010, when continuous yards of Olight are printed in a "roll to roll" web printing process, which is how magazines are produced. A display manufacturer could simply print 200 yards of Olight, and then chop it up into massive screens for HDTVs—HDTVs that could be rolled up and put in the closet after the movie's over.

FAST FORWARD

BY TOM R. HALFHILL

Ultrawide Hype

Wi-Fi is rapidly moving beyond early-adopter status to the I-gotta-have-it stage for home networks and mobile computers. Yet already, some over-eager experts are hyping ultrawideband (UWB) as a new standard that could make Wi-Fi (802.11b/g) obsolete.

Whoa! If you're tempted to hold off on Wi-Fi because you heard UWB is coming, it's like hesitating to buy an old-fashioned gasoline-powered car because hydrogen fuel cells are just around the corner. (Yeah, *right.* I'm still waiting for those turbines that Detroit was hyping in the 1960s.) In reality, standards-based UWB products are years away and won't be the Wi-Fi killers that some pundits are predicting.

First of all, UWB isn't even a true standard yet. It's an experimental specification that's legal only in the U.S., and only since January has an industry task force been considering UWB as a standard for wireless personal-area networks (IEEE-P802.15.3a for WPANs). There are still a zillion details to hash out—and with 31 proposals from 28 companies, expect a lot of hashing. In fact, three companies couldn't even agree on their own standards internally, which is why they submitted multiple proposals. Optimists think the first standard UWB products will appear in 2005–2006.

UWB is controversial among engineers because it radically departs from other wireless standards. Usually, a wireless standard either has its own special slice of radio-frequency spectrum or a special frequency-hopping pattern that avoids interference with nearby signals. Not UWB. It will use the same spectrum as other standards by disguising itself as background noise below the government's mandated noise threshold. Other receivers will perceive UWB signals as static. Only a UWB receiver will be able to sift the data out of the noise. At least, that's the plan.

Visionaries are promising data rates as high as 500 megabits to 1 gigabit per second, which is 50 to 100 times faster than today's 802.11b Wi-Fi, and 10 to 20 times faster than the latest 802.11g. That sounds great—but even something wireless can have strings attached. UWB operates at extremely high radio frequencies (3.1GHz to 10.6GHz), which severely limits its range. The speediest data rates are within 10 meters of the access point (hot spot), and throughput plunges rapidly to below 802.11g levels if you move beyond 15 meters. It's a WPAN, not a WLAN.

UWB is a promising technology that's worth following, but don't let it stop you from adopting today's wireless networking. We've been chained down by wires and cables for too many years to wait any longer.

Tom Halfhill was formerly a senior editor for Byte *magazine and an analyst for* Microprocessor Report. *He is now a technical writer/analyst in Silicon Valley.*

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DO YOU REMEMBER THE DAY THAT THE NUBIANS SET FOOT ON THE MOON?

IT WAS 58 MINUTES IN THE MAKING. History changes in an instant. Never more so than in Rise of Nations, a new real-time strategy game from Brian Reynolds, lead designer of Civilization II. Experience the depth of turn-based strategy games at an RTS pace through 6,000 years of history and 18 ancient civilizations. It's the most intense RTS of its kind. Think fast. Fight faster. Defend, defeat, bargain, befriend, plot and plunder. Do it all under the gun with zero margin for error. Nothing is historically impossible and only the quick and the brazen survive.

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You Could Even Say It Glows

Ambient Devices introduces 'glanceable' technology

In every movie about the future—from *Metropolis* to *Clockwork Orange* to *Minority Report*—everywhere you look there's stuff that glows, blinks, or pulsates. Now, at last, we know what all that stuff was doing in the background. We figured it out when we saw the handiwork of Ambient Devices (**www.ambientdevices.com**), which designs unobtrusive doodads that keep people informed.

Ambient Keyfob

The first gizmo is the appropriately cosmic-sounding Orb. It's a frosted-glass sphere with red, green, and blue internal lights, and appears to be purely decorative at first glance. But when certain criteria are met—for example, traffic is light on 101 North, or your stock portfolio is tanking—the Orb glows a different, customizable color.

Ambient Orb

Another ambient device is a pinwheel that can be set to spin slowly when you've got a single e-mail, and quickly if you've got 100. There's also a wristwatch that can glow softly red to indicate, "Everything's A-OK," but then blink rapidly to say, "The contractions just started!" Ambient's luminous messengers receive their signals from a nationwide wireless network, piggybacking on the paging network of Weblink Wireless. You configure each device through a simple web interface on your PC.

Ambient Pen

At press time, only the Ambient Orb was available for purchase (at $300). There's no monthly fee for the basic channels, which include weather and stock market information. For an extra $6 a month, you can get premium channels that include personalized stock information and Ambient Messaging ("Hey, look, Dieter and Gisela are online—deathmatch!").

Excuse Me, Ma'am, Do You Have the Terror?

Terror-o-meter takes the guesswork out of fear

Here in the States, we have a Terror Threat Assessment system that indicates the general likelihood of a terrorist attack against American interests. But it's a rather imprecise system, and doesn't communicate the exact amount of panic, fear, and dread that's appropriate at any given moment. That's where the Terror-o-meter from Junkfunnel Laboratories (**www.junkfunnel.com**) comes in. It's a smart-looking device that you hang on the wall and connect to your network with standard CAT-V Ethernet cabling. The meter gauges the world's terror level by analyzing online news feeds, and then displays the results (based on the number of references to terror) in an unambiguous, easy-to-read VU meter. Yes, you can buy the Terror-o-meter. Just contact **casey@junkfunnel.com**, and you'll never be afraid of not being enough afraid, ever again.

GAME THEORY

BY THOMAS L. McDONALD

The Age of id

The story of id Software is the story of computer gaming in the 1990s, and David Kushner does a fine job of documenting it in *Masters of Doom* (Random House, $24.95). The tale is at the heart of the computer revolution, partly because of id's pervasive influence, partly because of the archetypal nature of its rise to fame: Ne'er-do-well computer geeks wired on Coke, pizza, and a passion for games retreat to their garage/basement and emerge with a killer app. Id's killer app turned out to be the most important title in the history of PC gaming, and its graphic engines drove both game and hardware design for a decade. The two men at the core of this revolution—a socially inept programming genius and a cocky designer who cultivated a rock-star persona—were yin and yang: one of those ideal teams where each needed the other to form the complete picture. And, like most such teams, the delicate balance of those opposites eventually tipped out of whack, destroying the whole thing.

Covering gaming for the past 13 years, I've had an opportunity to watch this strange and fascinating story as it unfolded, but only time gives us the proper perspective to really understand it as a whole, and that is what Kushner has done in *Masters of Doom*. Neither hatchet job nor hagiography, *Masters of Doom* is a good tale well-told. The prose is clean and lucid, and with few exceptions Kushner stays out of the way and lets the story tell itself, warts and all. Though he clearly had access to Carmack, Romero, and many others at id and Ion Storm, he didn't sugar coat their deficiencies. This isn't a nasty, muckraking exposé, but neither is it fan-boy fluff.

It does what the monthly media couldn't do: take time to paint detailed portraits of complex people. With few exceptions, magazines don't probe particularly deep, so id and its people became caricatures, alternately exalted as game gods or heaped with contempt. Carmack became the good-guy brainy nerd, Romero the egomaniacal profligate slacker. Neither portrait was accurate, but turning people into cartoons is what the media does best. It made good, simple copy and set up easy punch lines. Right in this spot, after the release of *Daikatana*, I remarked about Romero, "it's *fun* to savage him personally, it's just not *right*." While the excesses of Ion Storm warranted contempt, nobody deserved the personal abuse directed at Romero. David Kushner does a fine job of turning the caricatures back into people, and in the process documents a revolution.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

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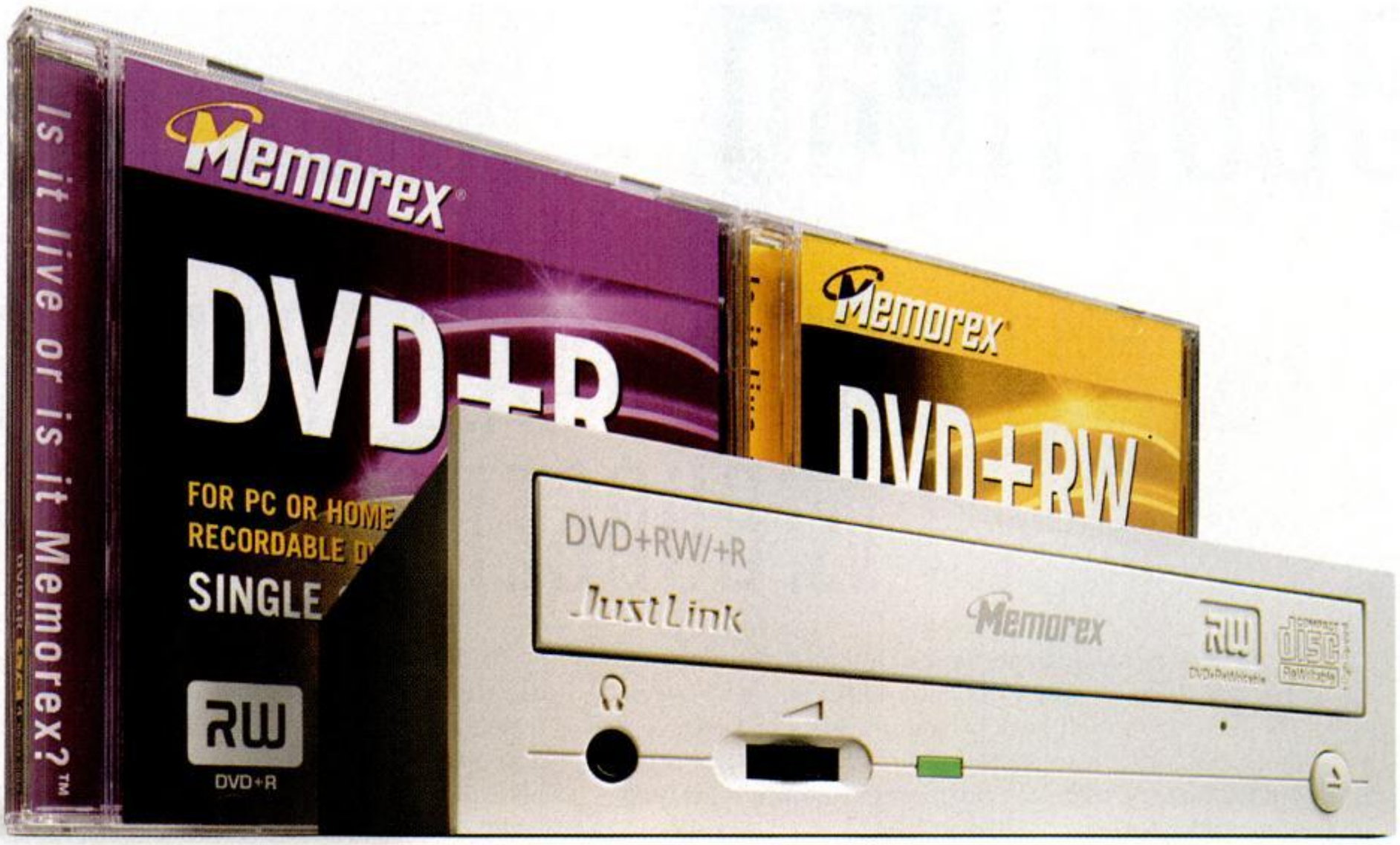

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Head2Head

A showdown among natural PC competitors

THIS MONTH: INTEGRATED GRAPHICS VS. BUDGET CARDS

We've never been fond of integrated graphics. Sure, if your videocard conks out, it's always nice to fall back on the graphics processor that's built into your motherboard chipset. But throughout PC history, even the best integrated graphics have, well, sucked.

Then along came nVidia, which aspired to offer a whole new level of graphics performance with its nForce-series mobo chipsets. And although they're certainly not capable of industry-leading 3D performance, the nForce and nForce2 chipsets have managed to, well... not suck so badly. To wit, the nForce2 represents the current pinnacle of mobo-bound 3D acceleration.

We know most power users will never use integrated graphics, but what about their friends and family members? What kind of 3D graphics are *they* getting stuck with? We decided to find out by firing up MSI's K7N2G nForce2 motherboard, and then comparing its integrated performance with a slew of low-end stand-alone cards, each costing less than $100.

—GORDON MAH UNG

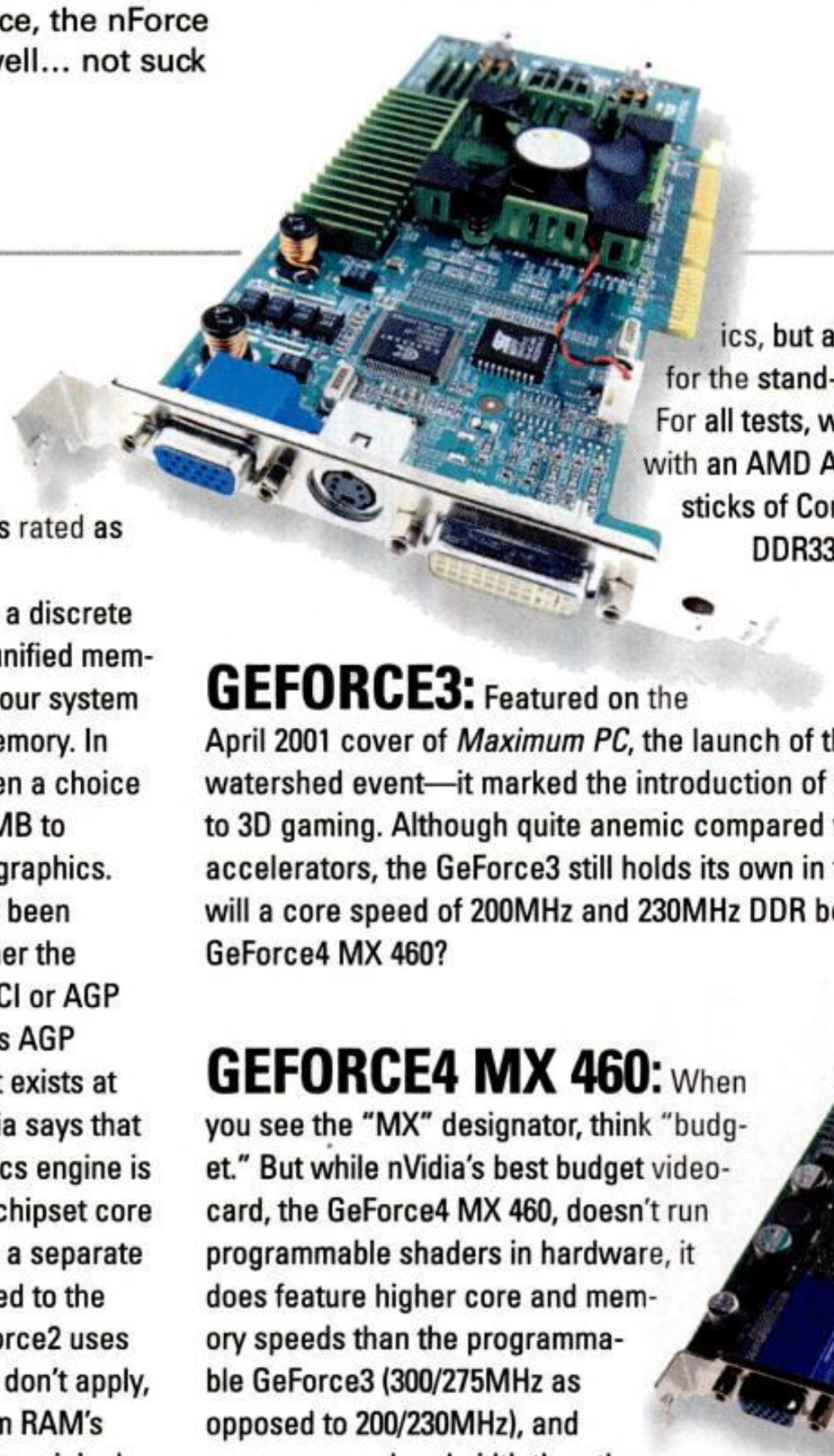
THE CONTENDERS

NFORCE2: Featuring integrated 5.1 audio, 10/100 Ethernet, USB 2.0, FireWire, Serial ATA and, of course, nVidia's IGP northbridge, the MSI K7N2G motherboard has it all. Put this sucker in your case, and you may never need to use any of your PCI slots! The board's nForce2 graphics core is rated as the equivalent of a GeForce4 420 MX running with 64MB.

Naturally, the nForce2 doesn't have a frame buffer the way a discrete graphics card does. Instead, nVidia uses a variation of UMA (unified memory architecture). In a nutshell, the nForce2 grabs a chunk of your system memory as video memory. In the MSI, you're given a choice of selecting from 8MB to 128MB of RAM for graphics.

There's recently been a stink about whether the nForce2 uses the PCI or AGP bus, and whether its AGP implementation (if it exists at all) is 4x or 8x. nVidia says that because the graphics engine is integrated into the chipset core (and not located on a separate piece of silicon wired to the northbridge), the nForce2 uses neither AGP *nor* PCI! For this reason, AGP 4x and 8x concerns don't apply, and video memory bandwidth is generally limited by the system RAM's speed. Nonetheless, for what it's worth, nVidia did state that the original nForce had internal AGP speeds of up to 6x.

The MSI K7N2G motherboard was not only used to test nForce2 graphics, but also as a testing platform for the stand-alone videocards. For all tests, we ran the motherboard with an AMD Athlon XP 3000+ and two sticks of Corsair DDR400 running at DDR333.



GEFORCE3: Featured on the April 2001 cover of *Maximum PC*, the launch of the GeForce3 was a watershed event—it marked the introduction of programmable shaders to 3D gaming. Although quite anemic compared with today's DirectX 9 accelerators, the GeForce3 still holds its own in the poor-boy scene. But will a core speed of 200MHz and 230MHz DDR be enough to trump the GeForce4 MX 460?

GEFORCE4 MX 460: When you see the "MX" designator, think "budget." But while nVidia's best budget videocard, the GeForce4 MX 460, doesn't run programmable shaders in hardware, it does feature higher core and memory speeds than the programmable GeForce3 (300/275MHz as opposed to 200/230MHz), and more memory bandwidth than the GeForce4 Ti 4200. We didn't think the nForce2 could match the raw power of GeForce4 MX 460.

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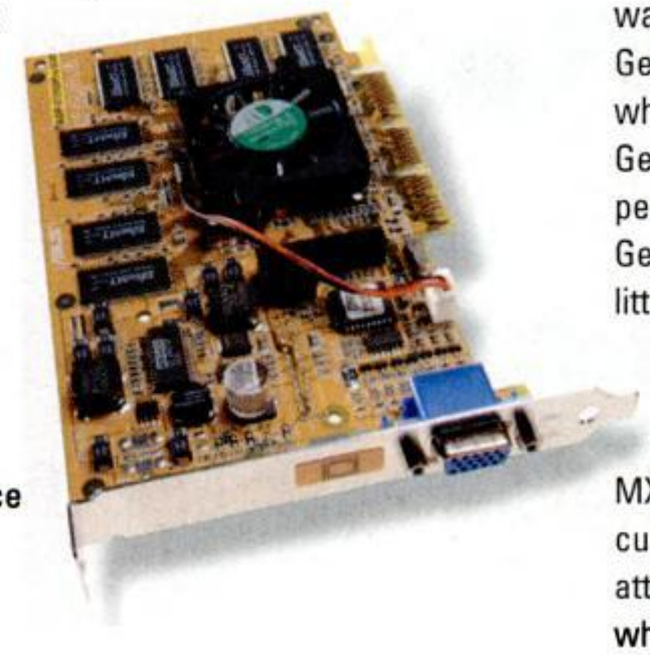
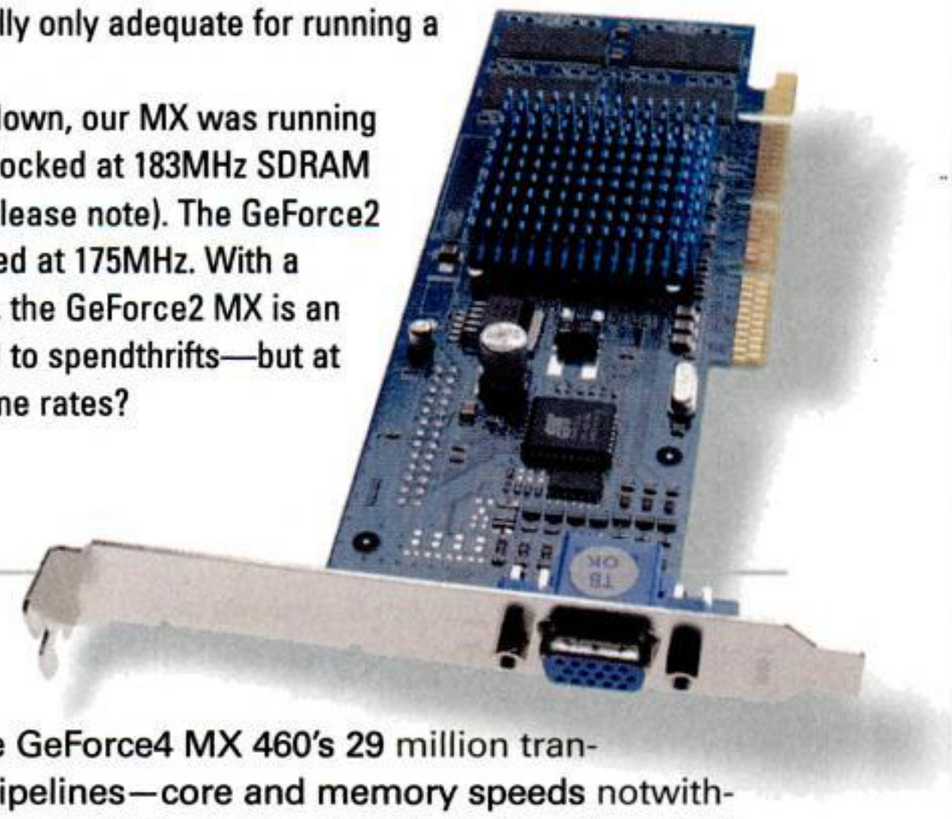
GEFORCE2 PRO: We actually used an upclocked version of this card to power the Dream Machine we built in 2000—and now it does yeoman chores for low-end PCs everywhere. Can the old GeForce2 Pro match nForce2 performance? With its 200MHz core and 200MHz DDR RAM, we thought it might. Although it can claim only T&L as a "cool feature," there are still plenty of GeForce2 Pro cards running on office machines all over the world.



GEFORCE2 MX: Just last year, an integrated chipset was considered spectacular if it matched the performance of a GeForce2 MX–based videocard. In fact, Intel was pretty happy when its 845G chipset, boasting "Extreme Graphics," met the GeForce2 MX on the field of battle. But the truth is that for most people who buy and use integrated graphics, the GeForce2 MX is really only adequate for running a little *Flash*.

For this showdown, our MX was running 32MB of RAM clocked at 183MHz SDRAM (that's *not* DDR, please note). The GeForce2 MX core was clocked at 175MHz. With a current price of $30, the GeForce2 MX is an attractive videocard to spendthrifts—but at what cost to 3D frame rates?



THE CONTEST

To see which GPU would come out on top, we picked a stack of current gaming benchmarks including *Quake III Arena, 3DMark2001 SE, Comanche,* and *Unreal Tournament.* Except for our old *Quake III Arena* benchmark, which we ran at 1280x1024 using the large Pad Shop maps, we ran all our tests at 1024x768 (the resolution that low-end gamers would use).

If you've been thinking that nForce2 integrated graphics can keep pace with the GeForce4 MX 460 or GeForce3, you've been deluding yourself. In fact, we don't expect any "real" performance from an integrated chipset until nForce3 comes out.

And despite our conjecture that the highly clocked GeForce4 MX 460 would be the overall champ, the old GeForce3 nosed by it to steal victory. It turns out that in this contest, the GeForce3's 57 million transistors and four pipelines beat the GeForce4 MX 460's 29 million transistors and two pipelines—core and memory speeds notwithstanding. What's more, both cards cruised into the winner's circle, and then waited for the other three contenders to follow.

Third place was a bit of a photo finish. The GeForce2 Pro just edged the nForce2 integrated graphics, but the benchmark results were generally very close. nVidia says the nForce2 is the equal of a GeForce4 MX 420, a card that uses SDRAM instead of DDR.

Dead-last was the GeForce2 MX. No surprise there.

THE UPSHOT

While fine for the occasional nostalgia game, the nForce2 is better suited for people who don't know DirectX from a hole in the ground. The old adage that CPUs will always get faster and integrated graphics will always suck seems to still apply. As you can see from the benchmarks, using nForce2 graphics to run today's demanding games could be very, very frustrating. The nForce2 can barely run Q*uake III*, so you can forget about *Doom III* wholesale.

	NFORCE2	GEFORCE2 MX	GEFORCE2 PRO	GEFORCE4 MX 460	GEFORCE3
Core/RAM speeds	100MHz/ N/A	175MHz/183MHz SDRAM 64-bit	200MHz/400MHz DDR 128-bit	300MHz/550MHz DDR 128-bit	200MHz/460MHz DDR 128-bit
RAM	128MB	32MB SDR	64MB DDR	64MB DDR	64MB DDR
Price	Free	$30	$58	$95	$82
3DMark2001 Game 2 High	38.3 fps	27.1 fps	42.5 fps	60.8 fps	**79.7 fps**
3DMark2001 Game 3 High	40 fps	29.1 fps	48.1 fps	68.5 fps	**70.4 fps**
3DMark2001 Game 4	N/A	N/A	N/A	N/A	**44.8 fps**
Comanche (audio off)	24.82 fps	16.95 fps	26.68 fps	**38.76 fps**	32.7 fps
Quake III MPC Demo (max qual, audio off)	51.9 fps	32.9 fps	49.9 fps	115.2 fps	**117.8 fps**
UT2003 Fly-by	52.13 fps	31.6 fps	54.9 fps	86.6 fps	**99.5 fps**
UT2003 botmatch	32.7 fps	21.4 fps	34.4 fps	55.2 fps	**56.6 fps**

Fastest score in each test are bolded.

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WatchDog

Say hello to Bella,
WatchDog of the Month.

Maximum PC takes a bite out of bad gear

THIS MONTH: The WatchDog goes after...

>More bad capacitors > Metric system >IBM monitor >Overseas shipping

Pop a Cap in Your Motherboard

Complaints of bad capacitors in motherboards continue to dribble in to the Dog (see the May 2003 issue of *Maximum PC* for the initial report). Many mobo brands seem to be affected, but only one company has stepped forward to address the problem. An Abit company spokesman told the Dog that Abit has implemented a three-year warranty on all its motherboards. However, the warranty is conditional. For the first two years, parts and labor are free. For the third year, only parts are covered and there is a $25 service charge. If the consumer cannot provide an invoice, the serial number will be used to determine the date of manufacture and warranty coverage.

The spokesman said that Abit has switched capacitor suppliers to Rubycom, supposedly among the best in the industry, for its new motherboards. The company also said that the belief that all suspicious capacitors will fail is incorrect. The company said the bad capacitors only increase the chance of failures. "There really is no way to know which capacitors are bad. What happened over the last year or two was rather an increase in the rate of failure for boards with the older capacitors." Even with the best capacitors, the company said there will still be some failures. "If there is a lot of heavy overclocking and voltage tweaking and 24/7 operation, the failure rate will go up. It is only a small percentage of boards that might have the capacitor problem; much like fruit, there's going to be some that might be rotten no matter what."

> *"IF THERE IS A LOT OF HEAVY OVERCLOCKING AND VOLTAGE TWEAKING AND 24/7 OPERATION, THE FAILURE RATE WILL GO UP."*

This MSI Athlon motherboard shows signs of possessing bad capacitors. Notice the bulging tops of the capacitors, and the burn marks on the one closest to the front (possibly from bad electrolytic formula).

The spokesman said that Abit isn't the only company affected by the capacitor problem, but it is the only company to admit there is a problem and address it. "With other companies, you have to RMA the board only through the place where you bought it, sometimes leaving the end-user with no recourse if the reseller refuses to serve him or has gone out of business. Abit has a new eRMA policy where anyone can directly RMA the board through Abit's web site 24/7."

This Western Digital WD1200JB holds 120GB of data, or 111GiB.

Gibibytes or Gigabytes?

DEAR DOG: Recently, I thought I had purchased a Western Digital 120GB external hard drive with a FireWire interface. But when I got it, it wasn't actually a WD enclosure, but an off-brand product. When I plugged it in, the drive said it had just 111GB, not 120GB. Did I eat the bear, or did the bear eat me?

— JASON SASSENGER

THE DOG RESPONDS: This isn't a new issue, but it is worth revisiting. It all comes down to how you define 1GB. Windows uses one definition while hard drive manufacturers use another. The Dog asked a hard drive vendor to explain its rationale and was told that it's a Microsoft terminology problem. "Hard drives use gigabytes, or 10^{10}. Microsoft uses *gibibytes* but labels them as gigabytes. Microsoft's gigabyte is 1,073,741,824, thus it subtracts seven percent. According to the National Institute of Standards and Technology (NIST), $120x10^{10}$ divided by 1073741824 = 111.7 gibibytes, not gigabytes as Microsoft would have you believe."

While most PC-philes (including the Dog) have traditionally sided with the Microsoft definition, it appears we're on the wrong side of the argument, and it may be the fault of the metric system. According to the NIST, 1GB is 1,000,000,000. Further quoting from NIST:

"Once upon a time, computer professionals noticed that 2^{10} was very nearly equal to 1,000 and started using the (International System of Units) prefix 'kilo' to mean 1,024. That worked well enough for a decade or two because everybody who talked kilobytes knew that the term implied 1,024 bytes. But almost overnight, a much broader 'everybody' owned computers, and the trade computer professionals needed to talk to physicists and engineers and even to ordinary people, most of whom know that a kilometer is 1,000 meters and a kilogram is 1,000 grams.

"Then data storage for gigabytes, and even terabytes, became practical, and the storage devices were not constructed on binary trees, which meant that, for many practical purposes, binary arithmetic was less convenient than decimal arithmetic. The result is that today 'everybody' does not 'know' what a megabyte is. When discussing computer memory, most manufacturers use megabyte to mean 2^{20} = 1, 048,576 bytes, but the manufacturers of computer storage devices usually use the term to mean 1,000,000 bytes. Similarly, some designers of local area networks use megabits per second to mean 1,048,576 bit/s, but all telecommunications engineers use it to mean 10^6 bit/s, or 1,000,000 bit/s. And if two definitions of the megabyte are not enough, a third megabyte of 1,024,000 bytes is the megabyte used to format the familiar 90mm (3 1/2 inch) '1.44 MB' diskette. The confusion is real, as is the potential for incompatibility in standards and in implemented systems."

Isn't this the same problem that sent the Mars probe hurtling into the planet's surface? Damn you,

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"The latest version, Cool Edit Pro 2.0, is simply smokin'!...I have also used Cool Edit in my studio when other, much more expensive software simply fizzled or choked on a project– CEP2 worked like a charm!"

– Gary Dean Ahrens
DJ Times
September 2002

"A Mac-using colleague said to me recently, 'I hate Syntrillium.' When I asked why he replied 'Because they don't make Cool Edit Pro for the Mac.'"

– Roger Derry
Line Up
The Journal of the Institute of Broadcast Sound
June/July 2002

cool edit | pro
version 2

"Cool Edit Pro is an essential tool for laying down your musical ideas and finalizing them."

– Paul Riario
Guitar World
July 2002

"So here's the deal: If you're looking for a powerful Windows digital audio editing program, download a demo of Cool Edit Pro and check it out."

– Zack Price
Home Recording
October 2002

"Normally after doing a review, I uninstall the program to keep my system as simple as possible. But CEP2 is staying on the hard drive - with a desktop shortcut, too."

– Craig Anderton
Keyboard Magazine
August 2002

"Don't pass on the latest version of this affordable classic if you're into digital audio creation and editing on the PC."

– James Kim
TechTV
August 2002

"There is simply no better deal out there for the professional quality and interface it offers."

– Scott Colburn
Tape Op Magazine
September/October 2002

"Cool Edit is still the coolest thing around for editing audio on the PC."

– Al Peterson
Radio World
July 2002

"There can be few projects that Cool Edit Pro could not handle with ease, finesse and aplomb. The version 2 update has honed what was already an accomplished program."

Computer Music
August 2002

version 2
The complete multitrack recording studio for your PC
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cool edit | pro

The reviews are in and the critics agree: Cool Edit Pro 2.0 is cooler than ever. It's packed with all the latest cutting-edge features for digital audio recording, editing, and mixing. Whether you're already a pro, or just getting started with PC-recording, Cool Edit Pro has the power, features, effects, formats, and flexibility to get the results you want. Even better, Cool Edit Pro users get free access to over 2,000 royalty-free loops of every kind of music imaginable from Loopology.com. You want to pack your PC with the best in audio? Try Cool Edit Pro.

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metric system! Sadly, according to NIST, while we're all wrong, we're also all sort of right. "Faced with this reality, the IEEE Standards Board decided that IEEE standards will use the conventional, internationally adopted definitions of the SI [International System of Units] prefixes. Mega will mean 1,000,000, except that the base-two definition may be used … until such time that prefixes for binary multiples are adopted by an appropriate standards body." More information on the confusing topic is available at: http://physics.nist.gov/cuu/Units/binary.html.

From the Halls of Amazon, to the Shores of...

The Dog received numerous letters in response to Jeremy Broin's letter (March 2003) requesting that tech stores make it easier for overseas military servicemen and servicewomen to order and receive PC parts. Reader Sgt. Jeff Lopus chimed in with the web site www.oconus.com, which lists vendors that currently ship to the military's APO and FPO addresses.

Reader John Carrigan had an even more interesting tip regarding the limitations of shipping overseas: "I used to be stationed in Europe and had the same problem ordering from web sites that had no APO/FPO support. Here is how I got around it. When filling out shipping information on these web sites, use "APO" for the city (or FPO, depending on your area of the world and the service you're in). You will also need to put the actual zip code where your regular APO/FPO mail goes. For the state, write the actual state where the mail is processed before it leaves the U.S. and gets to your APO/FPO.

Members of the 82nd Airborne Division deployed in the Persian Gulf may now have an easier time buying PC gear online. Staff Sgt. Christopher Paul (far right in the first row) is a *Maximum PC* reader, and has been sending frontline reports to the magazine.

For instance, the last line of my overseas address was APO, AE 09705. Since I was in AE (Europe), my mail was processed in New York before it came to my APO. So for the purposes of shipping info, I would write APO, NY 09705. It worked every time, and I ordered a lot of stuff in the four years I was there. I'm not sure where mail is processed for AA or AP designations, as I was never in those parts of the world, but military personnel stationed overseas can go to their local APO/FPO and find out which state their mail is processed in and from where it debarks the U.S. Then use that info when placing shipping orders at web sites that don't have APO/FPO options. Customs regulations still apply, and forms will still need to be filled out by the shippers, but I never had a problem with this from any company. Hope this helps our servicemen and women. It sure helped me!"

> *INSURE YOUR SHIPMENT. IF IT GETS LOST, GOD ONLY KNOWS WHERE IT IS.*

Finally David Doty had a good bit of advice for PC enthusiasts serving overseas:

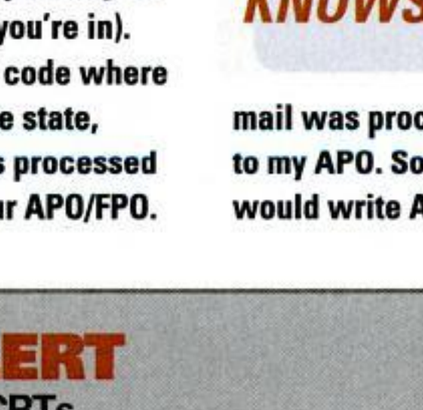
➤ Insure your shipment. If it gets lost, God only knows where it is. One box I ordered from Newegg.com did get lost and was replaced with no problem after the required 30-day wait.

➤ No boxes over 70 lbs can be sent by USPS Priority Mail. Also, some boxes are too big dimensionally. This means it may be difficult to order a monitor any larger than 17 inches. Anything larger is considered third-class freight. Good luck getting *that* shipped to you in a timely manner.

➤ Product activation for Windows XP may be an issue. It is considered a no-no to hook your new machine into the unit's network so you can activate Windows, update your drivers, surf, etc. You may have to make a DSN (free military call) to a stateside post operator to connect with Microsoft's 800 support number and get an activation code. ■

RECALL ALERT
IBM G51 and G51T CRTs

IBM is recalling some 56,000 CRT monitors that may overheat and catch fire. IBM said five customers have reported smoke from the overheating monitors, with one incident causing "minor property damage." A circuit board in the monitor is the likely culprit, and IBM is recalling some G51 and G51T monitors. The defective G51 and G51T monitors have the following model numbers on the back of the unit: 6541-02N, 6541-02E, 6541-02S, 6541-Q0N, 6541-Q0E, and 6541-Q0S. The label on the back of the recalled G51 models also has a manufacture date between June 1997 and September 1997.



The monitors were manufactured in China and Malaysia and were sold through IBM, MicroTouch Systems, and major stores including Best Buy, CompUSA, Office Max, and Radio Shack between June 1997 and December 1998.

If you have one of the recalled monitors, IBM asks that you stop using it immediately and contact the IBM repair center at 866.644.3155 between 9 a.m. and 7 p.m. eastern time, Monday through Friday. IBM will send consumers a box with prepaid shipping. IBM will then inspect the monitor to see if it's at risk of catching fire and make any necessary repairs. The company says the repairs will only apply to monitors that still function. Once repaired, the monitors will be returned to consumers. The company did not specify how long repairs might take. For more information, visit www.pc.ibm.com/g51recall/ or www.cpsc.gov/cpscpub/prerel/prhtml03/03088.html.

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

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(We believe that greatness speaks for itself.)

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Gaming enthusiasts and PC reviewers agree: TruePower is one of the world's most advanced lines of PC power supplies, with over 25 worldwide Editor's Choice or "Best Buy" awards and counting. With Dedicated Output Circuitry for maximum performance under any load combination, Voltage Feedback to maintain accurate voltage for top system stability, and Antec Low Noise Technology so you can hear your game's every audio detail, TruePower is the Worldwide Leader in Silence and Performance. But don't just believe us, visit http://www.antec-inc.com/true_awards.html and see for yourself. Get Top Score performance. Get *the Power of You.*

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VIDEOCARD ANSWERS

Don't trouble yourself with taking notes, because all the information you've ever wanted to know about videocards and 3D acceleration is provided right here!

By Will Smith

Whenever we survey our subscribers on their PC passions, they consistently choose videocards as the product category they're most interested in (motherboards follow closely at number two). With this in mind, we decided it was time for a long-overdue article—a comprehensive guide to all things videocard.

This month's lesson starts off with a look at the five videocards that everyone *must* know about. On the facing page, we explain why the cards are important, and how well they benchmark in three popular gaming tests. Next, we define just about every important term related to videocards and 3D acceleration (you might want to read this section first if you're new to the PC hardware scene). After that, we describe ATI and nVidia's driver control panels in vivid detail. Now, you might think you know how to adjust your card's driver settings, but we think even hardcore system tweakers will learn a thing or two from this lesson plan. We end our primer with a FAQ that addresses the videocard-related questions most often received by our resident PC doctor.

But wait, there's extra credit: This month's Head2Head (page 18) features a showdown between integrated nForce2 graphics and a host of budget videocards, and the How-To article that starts on page 50 describes exactly how you can best tweak your CRT monitor for perfect visual quality. Finally, if you don't find the answers to your own videocard questions in this issue, please send your questions to input@maximumpc.com with the subject header "videocard question." We'll forward your e-mail to the Doctor, who will do a "videocard answers mop-up" section in a future issue.

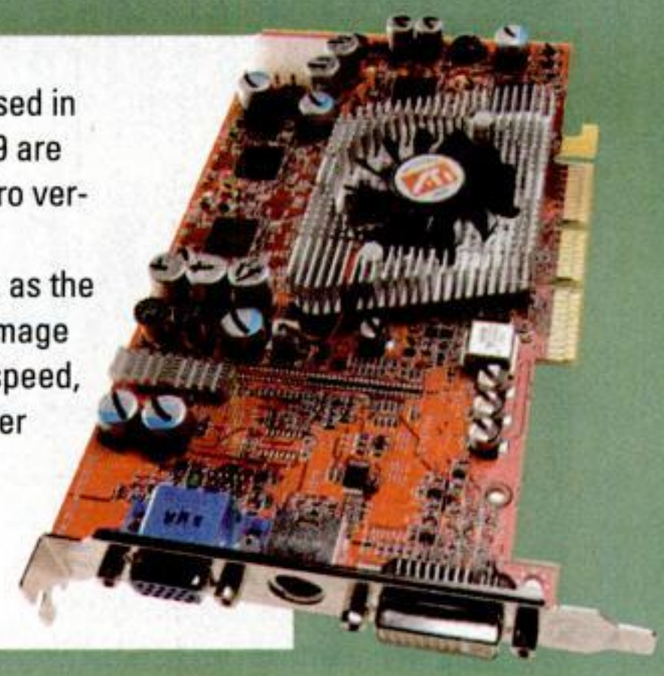
ATI Radeon 9800 Pro

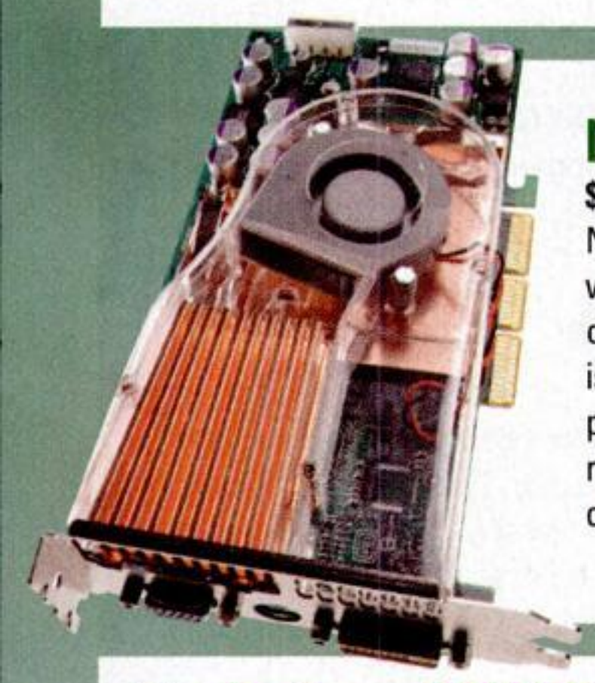
$400, www.ati.com

If you're looking for the absolute fastest 3D acceleration, the best visual quality, and a tidy package that doesn't require excessive cooling, the Radeon 9800 Pro is the ticket. The version pictured here features 128MB of 256-bit DDR memory running at 338MHz and an R350 core running at 378MHz. In English, this means the Radeon 9800 Pro is the fastest videocard available—and it is certainly the best current candidate to run *Doom III*. The card's awesomeness can be credited to support for DirectX 9 programmable shaders, the technology that will fuel the most breathtaking visual effects in games released in late 2003 and beyond. Other cards that support DirectX 9 are the Radeon 9500, 9600, and 9700 (plus their respective Pro versions), and the nVidia GeForce FX–based cards.

The 9800's excellent visual quality is no big surprise, as the previously released 9700 Pro itself produces top-shelf image quality. In fact, if you're willing to relinquish some raw speed, ATI's less expensive DirectX 9 cards might suit you better than the category-leading 9800 Pro.

3DMARK 2003: 5,525 3DMARKS
QUAKE3 MPC DEMO: 147.1 FPS
UT2003 BOTMATCH: 71.5 FPS





nVidia GeForce FX 5800 Ultra

$400, www.nvidia.com

No discussion of the best 3D videocards would be complete without talking about the GeForce FX. Unfortunately, while this card is very, very fast in the scope of available products, it isn't up to nVidia's typically stellar standards. Despite a high-powered 500MHz core and 128MB of 128-bit DDR-II memory running at 500MHz, the FX just doesn't match the performance of the Radeon 9800 Pro.

The GeForce FX is hobbled by a narrow memory bus, something that nVidia plans to remedy in its next offering (code-named NV35), which should sport 256MB of 256-bit DDR SDRAM. For what it's worth, we haven't been able to find any GeForce FX 5800 Ultras on store shelves, even after calling retailers across the nation. If you yourself should find an FX 5800 Ultra, you'd do well to avoid it. It costs the same as the 9800, but offers less performance, runs a lot louder, and takes up the PCI slot closest to your AGP slot.

3DMARK 2003: 4,560 3DMARKS
QUAKE III MPC DEMO: 138.7 FPS
UT2003 BOTMATCH: 65.0 FPS

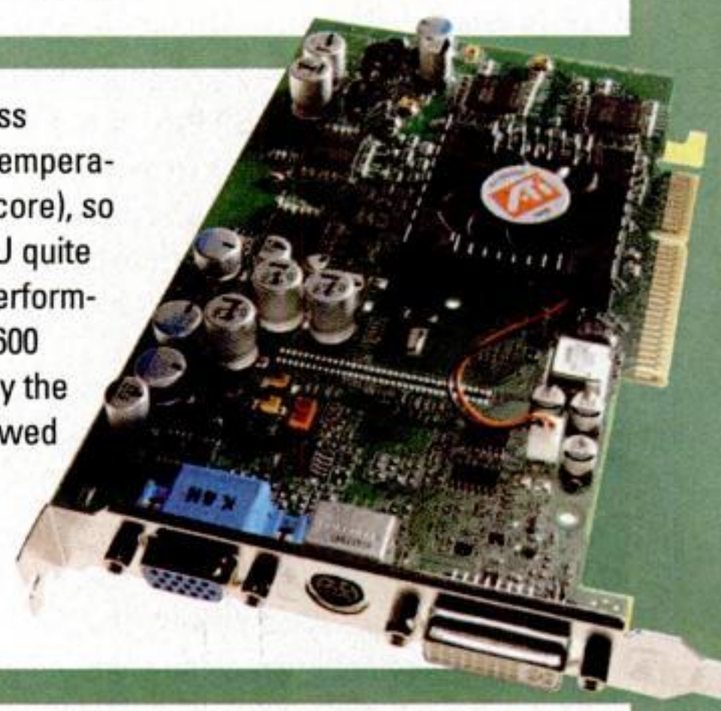
ATI Radeon 9600 Pro

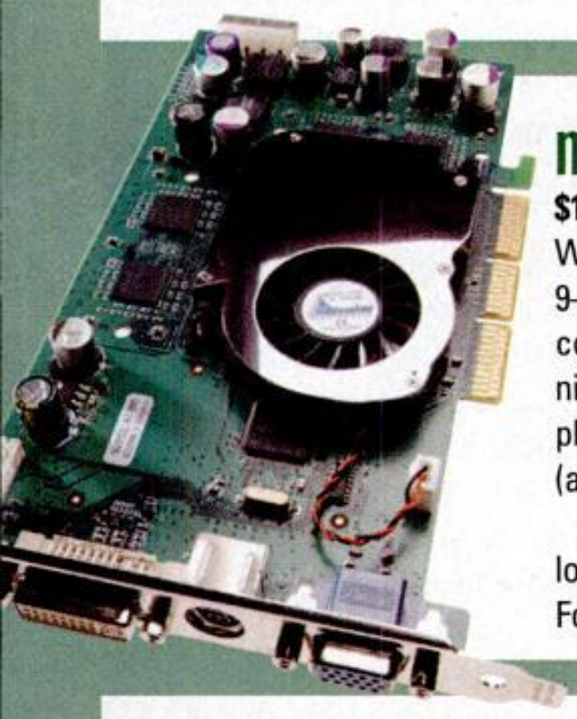
$200, www.ati.com

Welcome to the sweet spot. The 9600 Pro doesn't just boast ATI's first 0.13-micron GPU, it's also ATI's best videocard from a price-to-performance standpoint. With a 400MHz core and 128MB of 128-bit DDR memory clocked at 300MHz, ATI's second-tier card is slightly faster than the Ti 4600 (a former top-performer from nVidia that has since been replaced by the GeForce FX). The 9600 Pro, however, includes must-have DirectX 9 support, which the Ti 4600 lacks. Not a bad deal for a card that costs half of what you'll pay for a 9800 Pro.

The 9600 Pro's 0.13-micron core makes it a kick-ass overclocker. Its diminutive core runs at much lower temperatures than the 9800 Pro (which boasts a 0.15-micron core), so you should be able to crank up the speed of your GPU quite easily, even with the default cooler. This 9600 Pro's performance is just a bit better than the nVidia GeForce FX 5600 Ultra's, but its image quality is superior, and that's why the 5600 Ultra isn't being featured here (though it is reviewed on page 62 of this issue).

3DMARK 2003: 3,307 3DMARKS
QUAKE III MPC DEMO: 85.5 FPS
UT2003 BOTMATCH: 48.6 FPS





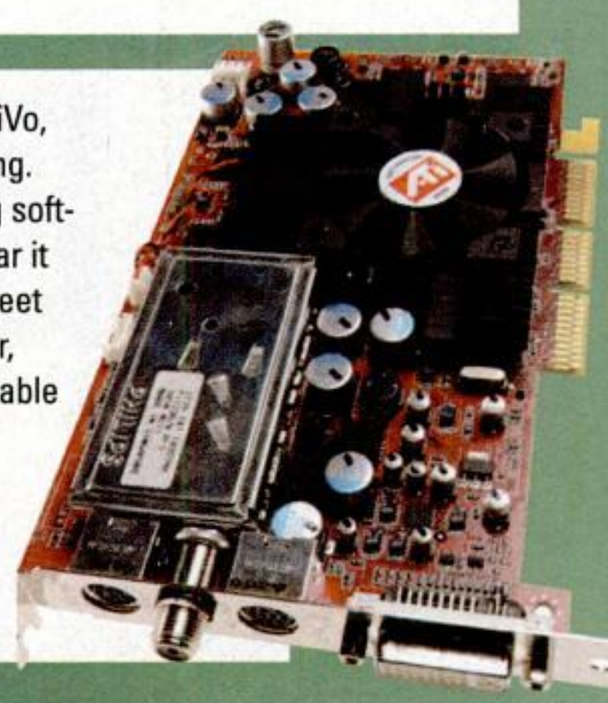
nVidia GeForce FX 5200 Ultra

$100, www.nvidia.com

What will $100 buy you? How about a brand-new DirectX 9–compatible videocard? The 5200 series from nVidia offers a compelling upgrade to all the unfortunate PC owners still running videocards from the GeForce2 MX era, and will let you play next-gen games like *Half-Life 2* or *Doom III* in all their glory (albeit not as fast as possible).

In a nutshell, the GeForce FX–powered 5200 Ultra features a lot of the goodness of the 5800 Ultra with none of the lameness. For one, it doesn't sound like there's a turboprop engine in your case because it eschews the stupid-big heatsink/fan combo for a more traditional cooler. As far as clock speeds go, the board we have sports 128MB of DDR memory running at 350MHz, and a 0.15-micron NV30 core running at 350MHz. So, what you essentially get is nVidia's latest core technology, but running at reasonable frequencies that don't require crazy cooling. Granted, the 5800 Ultra features DDR-II memory, but the 5200 Ultra's regular DDR is just fine for a $100 "tweener" upgrade.

3DMARK 2003: 1,616 3DMARKS
QUAKE III MPC DEMO: 71.5 FPS
UT2003 BOTMATCH: 27.3 FPS



ATI All-in-Wonder 9700 Pro

$450, www.ati.com

Two great tastes that taste great together. That's what you get when you combine a reliable, honest 3D accelerator and excellent TV tuner/video-capture features in one tasty AGP card. Granted, the 9700 Pro is no longer the best gaming GPU you can buy. That distinction belongs to the 9800 Pro. But the 9700 Pro is faster than the GeForce FX 5800 Ultra in today's best games, as evidenced by the benchmark results on this page. It will likely be slower than the FX 5800 Ultra in games like *Doom III*, but that's OK, because the AiW 9700 Pro isn't just a 3D gaming card—it's also a TV tuner that can do DVR functions a la TiVo, and a video-capture device for consumer-level video editing.

The next version of ATI's Multimedia Center TV viewing software should be available by the time you read this. We hear it will include a visual interface that can be viewed from 10 feet away—finally! We've also heard rumblings of an IR blaster, which will let your AiW change the channels on a digital cable or satellite receiver. More details to come.

3DMARK 2003: 4,799 3DMARKS
QUAKE III MPC DEMO: 149.6 FPS
UT2003 BOTMATCH: 70.9 FPS

All benchmarks were run at 1600x1200 in 32-bit color, except for *3DMark 2003*, which we run at default settings. The Radeon 9800 Pro and All-in-Wonder 9700 Pro were benchmarked using the release Catalyst 3.2 drivers, and the 9600 Pro was benchmarked using 3D driver version 7.84.10. Both nVidia cards were benchmarked using the 43.45 driver posted on nVidia.com.

GLOSSARY

Let's define the terms before we go any further

AGP: Accelerated graphics port. The standard PC interface for videocards. The current spec is AGP 8x, which provides about 2.1GB/s of bandwidth between the videocard and motherboard chipset.

AGP APERTURE SIZE: The amount of system memory an AGP videocard can use for storing 3D information.

AGP FAST WRITES: Enabling AGP Fast Writes lets a program access the videocard directly, instead of through system memory. This reduces bandwidth demands on the bus.

AGP PRO: A beefy version of the AGP interface designed to deliver extra power to workstation-class videocards. AGP Pro uses a slightly longer AGP slot, and comes in two flavors, 50-watt and 110-watt. Current consumer accelerators from ATI and nVidia use an onboard Molex connector to draw additional power, because the AGP Pro interface isn't ubiquitous.

ALPHA CHANNEL: Every pixel in a game is described by four color channels: R, G, B, and alpha. The first three channels store data on the pixel's mixture of red, green, and blue, while the alpha channel describes a pixel's relative opacity. In 32-bit integer color, the alpha value is contained in the last 8-bits of the pixel's color info.

ANISOTROPIC FILTERING: An advanced filtering technique that corrects a texture's perspective when the texture is drawn on an object that stretches deep into a scene.

ANTIALIASING: Any technique used to smooth jagged edges that are created when straight lines are drawn in a 3D game or program.

API: Application programming interface—basically a set of rules and routines that developers can use to design games and applications. APIs provide programmers with a set of pre-defined function calls that can be used for basic tasks, such as drawing windows and buttons, or advanced operations, like applying a bump map to a polygon.

BGA PACKAGING: The ball-grid array package allows RAM to run cooler at higher clock speeds than the earlier TSOP (thin, small-outline packaging).

BILINEAR FILTERING: The most basic filtering strategy, bilinear filtering reduces texture pixelization by blending adjoining textures at their seams. Modern 3D accelerators use bilinear filtering by default.

CG: nVidia's high-level shader language. It includes all the functions of Microsoft's high-level shader language (HLSL), as well as some functions specific to nVidia GPUs.

CORE CLOCK: The speed at which a 3D card's graphics chip runs, usually measured in megahertz (MHz).

DB-15: The standard 15-pin connector for analog monitors. If you use a CRT or analog LCD monitor, this is the connector you use.

DDR: Double data rate, usually used to describe memory. DDR memory can transfer two chunks of data every clock cycle, a "double-pumped" strategy that effectively doubles memory speed. (When we at *Maximum PC* describe the speed of a videocard's memory, we report the actual clock speed. Thus when we state a videocard has a 310MHz DDR memory clock, that card is transferring the same amount of data as 620MHz SDR memory would.)

DDR-II: The latest version of DDR memory. DDR-II memory doesn't transfer more data per clock cycle than original DDR memory, but it has been modified to run at much higher clock speeds than plain DDR.

DIRECT3D: Microsoft's 3D API. Includes all the function calls a developer needs to program old-style fixed-function games as well as new programmable shader games.

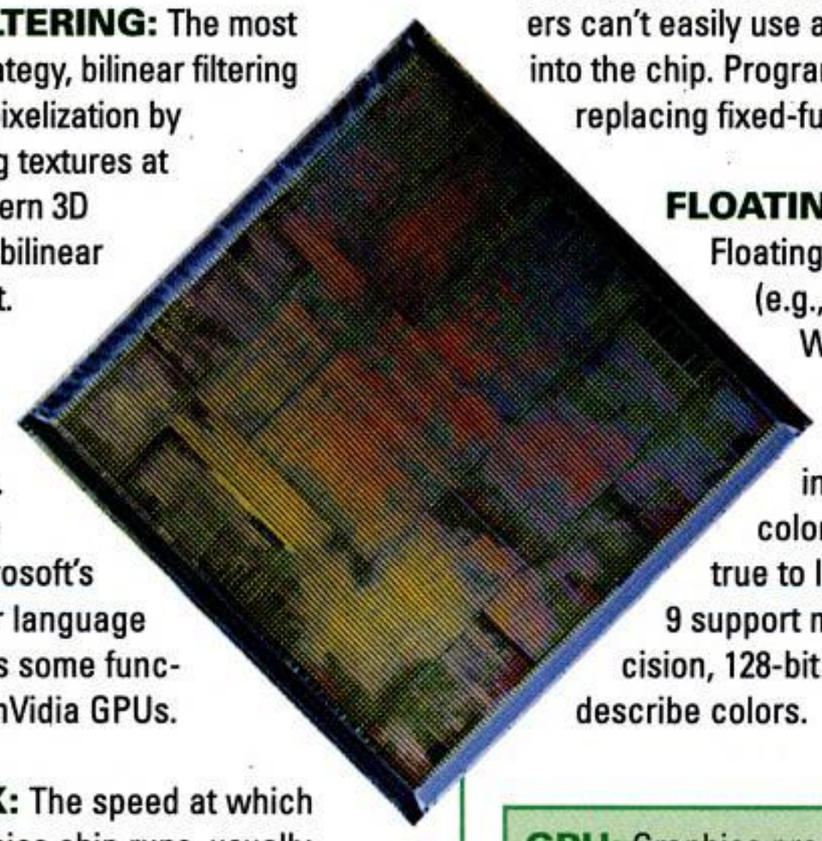
DVI: The connector used for digital LCD monitors; effectively eliminates the video noise from digital-to-analog-to-digital conversion.

DVI-D: A DVI hardware spec that only includes support for a digital signal. DVI-I cables will not fit into a DVI-D connector.

DVI-I: A DVI hardware spec that allows both analog and digital signals to be passed out the DVI port.

FIXED-FUNCTION: 3D chips running fixed function 3D pipelines can execute a limited number of functions very rapidly. Unfortunately, fixed-function pipelines are also inflexible, and developers can't easily use any functions that aren't built into the chip. Programmable shader pipelines are replacing fixed-function pipelines.

FLOATING-POINT COLOR: Floating-point numbers use decimals (e.g., 5.78) to describe a value. When games and applications use floating-point numbers to describe color, rendering errors are minimized, and colors become richer and more true to life. Videocards with DirectX 9 support must be able to use high-precision, 128-bit floating-point numbers to describe colors.



GPU: Graphics processing unit—the main chip on a videocard. The GPU performs all the calculations that draw 3D images on your screen. GPUs include a rudimentary level of programmable shader support, whereas VPUs are totally programmable. To minimize confusion and conform with the rest of the market, *Maximum PC* refers to VPUs as fully-programmable GPUs.

HARDWARE TRANSFORM AND LIGHTING: A graphics chip's hardware "T&L" engine can perform lighting calculations very quickly. Prior to the introduction of hardware T&L, these calculations were performed by the already overloaded CPU.

HIGH-LEVEL SHADER LANGUAGE: HLSL, the shader language that is included with DirectX 9. High-level shader languages allow game developers to use a C-like programming language to write shader programs for games and graphics applications. Without an HLSL, developers would have to use a confusing, hardware-specific assembly-level language.

INTEGER COLOR: Integer numbers have been used to describe color information since 3D graphics first appeared on the PC. Compared with floating-point numbers, integer numbers provide a very limited palette of colors. Integers are whole numbers (e.g., 4).

MEMORY BANDWIDTH: The amount of data that can be transferred between a graphics chip and its onboard memory. Measured in megabytes per second (MB/s). To calculate memory bandwidth, multiply your memory bus bit-width by the speed of the memory and the number of chunks of data transferred per clock,

Continued on page 28

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VIDEOCARD ANSWERS

Continued from page 26

then divide that number by 8. For example: For 128-bit DDR memory running at 500MHz, you would multiply 128 by 500 by 2, and then divide the product by 8. The result is 16,000MB/s, or 16GB/s.

MEMORY BUS WIDTH: The size of each data chunk that the memory bus can transfer each clock cycle. Usually measured in bits.

MIP-MAPPING: Mip-mapping provides several different levels of detail for every texture in a scene, and places low-quality, low-res textures in the background (where they're not easily noticed) and high-quality, high-res textures in the foreground (where game players focus their attention). Because low-res textures consume relatively little memory, mip-mapping can help speed up frame rates. Unfortunately, without filtering, demarcation lines can occur where different mip-map levels intersect.

MULTI-SAMPLING: An antialiasing technique that draws only the extra pixels needed to antialias jagged lines. Each GPU manufacturer uses a different algorithm to perform multi-sampling, so it's difficult to do an apples-to-apples comparison with anti-aliasing enabled. Multi-sampling is the preferred AA technique.

NV30: The code-name for nVidia's first DirectX 9 GPU, which is the core for the GeForce FX line. It operates at speeds up to 500MHz, and is fabbed on a 0.13-micron process. The 5800 and 5800 Ultra use the NV30 core, while the 5200 series uses the NV34 core, and the 5600 series uses the NV31 core.

NV35: nVidia's follow-up to the NV30. Fabbed on a 0.13-micron process, and the first nVidia chip to use a 256-bit memory pipeline. Expect to see it in June 2003.

OPENGL: A 3D API designed by an independent standards body. OpenGL differs from DirectX mainly in its extensibility—it can be changed and added to between major revisions to take advantage of new hardware features.

PCI EXPRESS: The next-gen PCI replacement, slated to appear in late 2003 or early 2004. PCI Express will also replace the AGP bus with PCI Express for Graphics, which should deliver 4GB/s of bandwidth to and from the 3D accelerator.

PIXEL SHADER: A programmable shader unit that manipulates individual pixels. Pixel shaders can create bump maps, reflective surfaces, and even programmatically generated textures.

PROCESS: In respect to microprocessors, the term refers to the size of transistors on a chip. Formerly measured in microns (one millionth of a meter), but now measured in nanometers (one billionth of a meter). A smaller process technology lets chips run at higher speeds and lower temperatures.

PROGRAMMABLE SHADER: Programmable shader units are the areas of GPUs that can run generalized programs rather than fixed 3D functions. There are two basic types of programmable shader units: pixel and vertex.

PROGRAMMATICALLY GENERATED TEXTURE: Traditional textures in a 3D game are created in a bitmap editor, such as *Photoshop*, whereas programmatically generated textures are described in real-time using shader programs. The newfangled textures do not require trilinear or anisotropic filtering in order to maintain the proper perspective when they're applied to a 3D model.

R300: The code-name for ATI's first DirectX 9 core. Fabbed on a 0.15-micron process, runs up to 325MHz, and supports a 256-bit memory pipeline. The R300 is used in the Radeon 9500, 9500 Pro, 9700, 9700 Pro, and All-in-Wonder 9700 Pro.

R350: ATI's follow-up to the R300. Fabbed on a 0.15-micron process, but operates at speeds up to 380MHz. The Radeon 9800, 9800 Pro, and All-in-Wonder 9800 Pro use the R350 core.

RAMDAC: Random access memory digital to analog converter. The RAMDAC converts the digital signal that is output from your 3D card's frame buffer into an analog signal that your CRT monitor can understand. Your videocard's maximum resolution and refresh rates are determined by RAMDAC strength.

RENDERMAN: A high-level language for the complex shaders that are used in very detailed animated movies (such as *Shrek*). Renderman shaders use multiple computers working in tandem to draw a single frame. It's a very long and laborious process, but 3D hardware companies hope to run Renderman-like shaders on consumer gaming hardware—at 60 frames per second—within the next few years. Full Renderman shaders can run on DirectX 9 cards, but not at full speed.

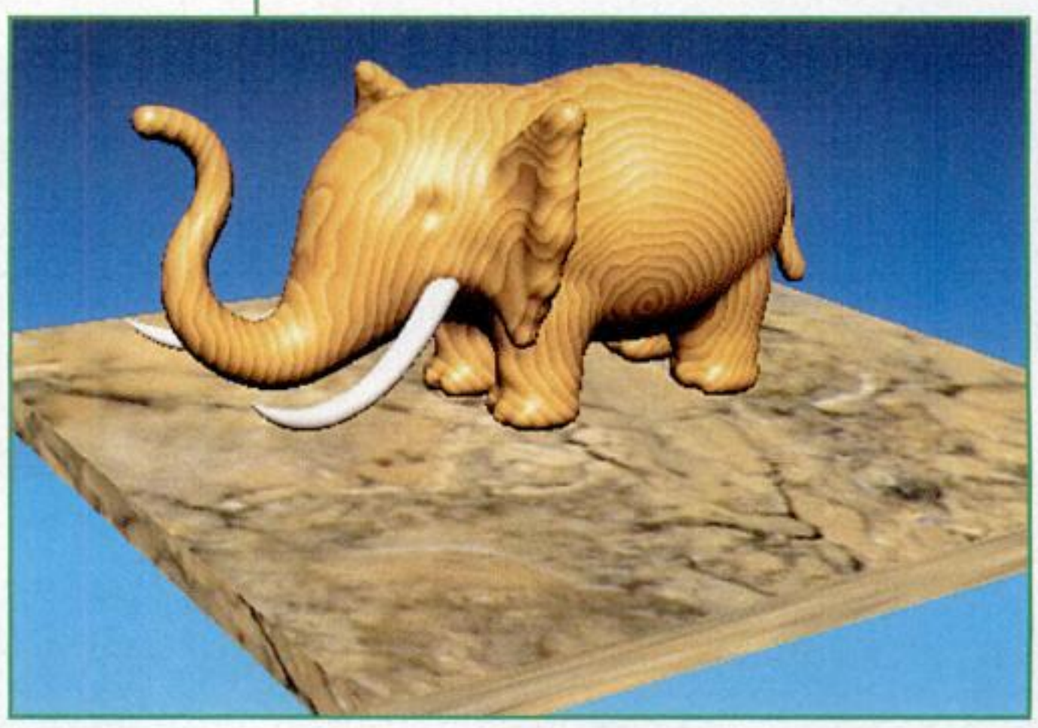
SDRAM: Synchronous dynamic random access memory. SDRAM is the dominant form of memory on today's videocards. Its low cost and high speed make for a perfect combo. Variants of SDRAM (e.g., DDR SDRAM) run as high as 500MHz and provide more than 20GB/s of memory bandwidth.

SUPER-SAMPLE: An antialiasing technique. Super-sampling renders a scene at a high resolution, then filters it down to the desired size. While this produces a terrific AA effect, it's very slow, especially compared with multi-sampling. Super-sampling isn't used on modern 3D accelerators.

TEXTURE COMPRESSION: Most modern APIs include some form of texture compression. Because most textures are simply bitmaps, they're easily compressed. This conserves the limited bandwidth between system memory and video memory, and between video memory and the GPU, with virtually no degradation in image quality.

TRILINEAR FILTERING: A texture filtering technique that blends pixels in different mip-maps to hide the seams between different mip-map levels.

VERTEX SHADER: A programmable shader unit that specializes in geometry calculations. Vertex shaders handle terrain morphing, some lighting calculations, and some shadow calculations.



VERTICAL SYNC: A setting that allows you to synchronize the frame rate of your 3D accelerator's output to the refresh rate of your monitor. Disabling vsync may allow your frame rate to go higher than your monitor's refresh rate, but at the expense of nasty horizontal tears across the full-screen image.

VPU: Visual processing unit. Some 3D companies designate their 3D chips as "VPUs." VPUs are fully programmable. In fact, in theory you could perform any calculation on a VPU that would run on a CPU. On the other hand, GPUs are capable of just a limited number of sequential operations.

VOLUMETRIC TEXTURE: 3D textures that can describe the rings of objects like tree rings. Volumetric textures consume significantly more space—and thus memory bandwidth—than normal two-dimensional textures, but can be efficiently generated using pixel shader programs.

Z-BUFFER: The Z-buffer controls an object's distance from the camera in a 3D rendered scene. It's also called the depth buffer. Low precision Z-buffers can make objects seem to pop, or clip, through each other.

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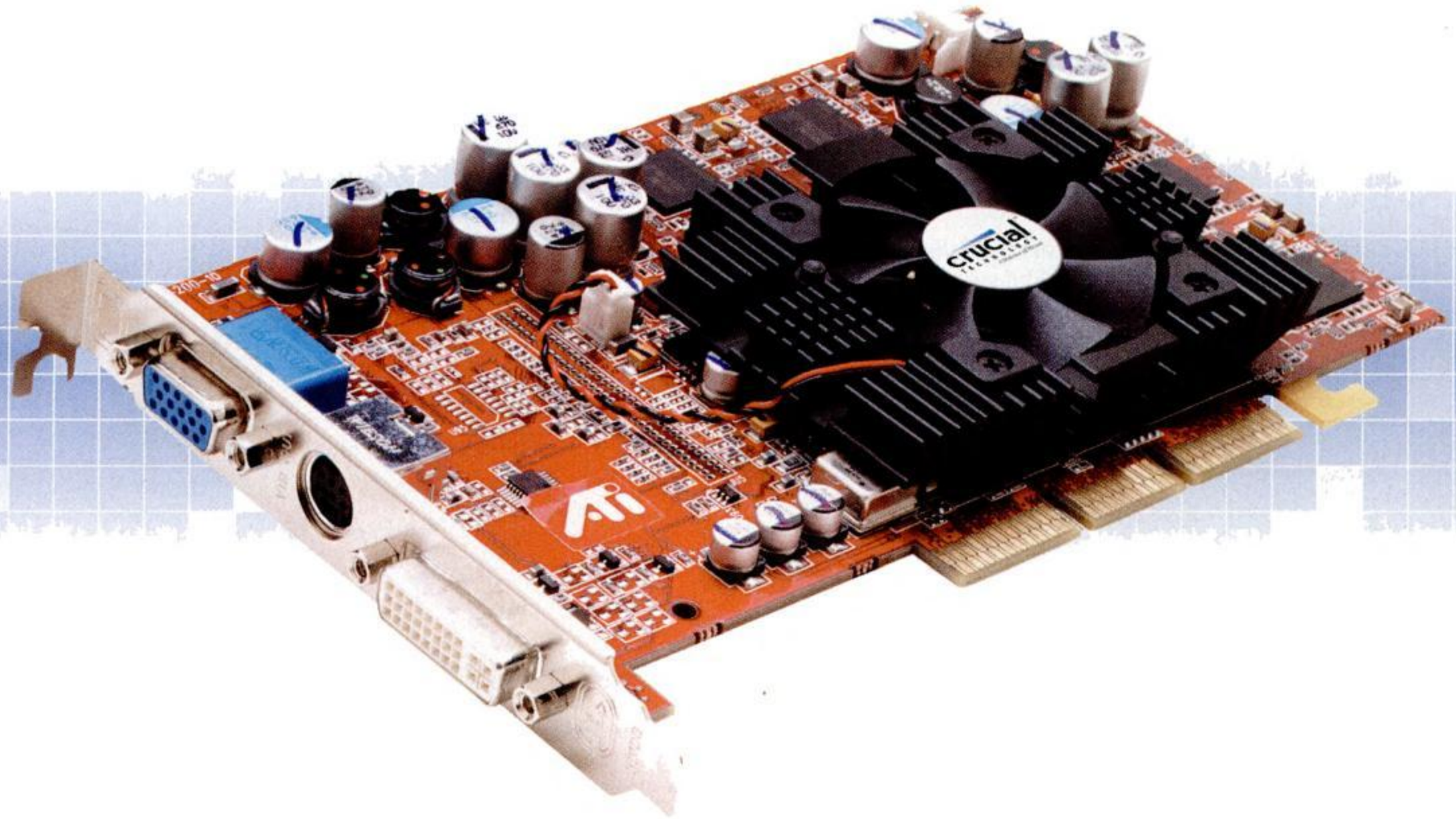

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ATI CONTROL PANELS

A detailed look at all the sliders, tabs, and features

Direct3D and OpenGL

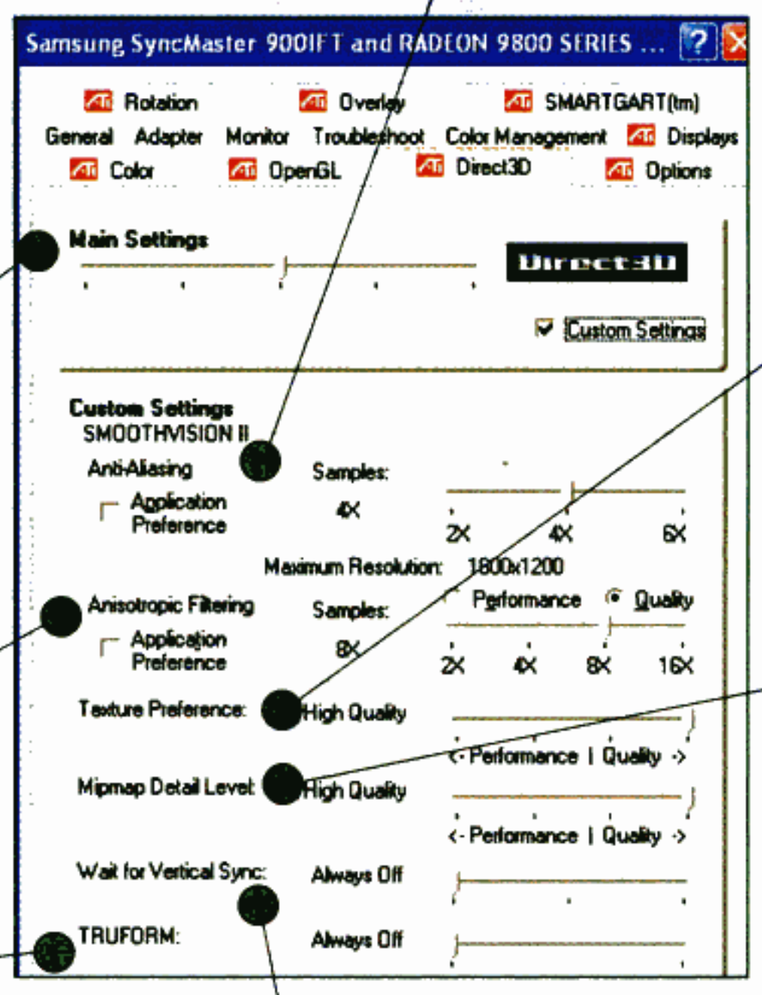
ATI's D3D and OGL control panels are virtually identical, so we'll be explaining both in one feel swoop.

MAIN SETTINGS: This slider adjusts 3D visual quality in games. Set the bar all the way to the left, and your games will run at maximum speed, but with severely reduced image quality. Slide the bar to the right, and your visual quality will improve at the expense of frame rates. If you want to fine-tune all the visual effects that the main slider's responsible for, click Custom Settings to reveal the full complement of options.

ANISOTROPIC FILTERING: For textures that need aniso filtering—such as those that stretch deep into a scene—the feature makes everything look significantly sharper. However, the majority of textures just don't need aniso, so enabling it (or setting the slider too far to the right) is a waste of memory bandwidth. Performance mode forces bilinear filtering on the textures, instead of using the superior Quality trilinear filtering method. We recommend clicking Application Preference, so that your game applies anisotropic filtering only to the textures that need it.

TRUFORM: Truform is an ATI-specific feature that is intended to improve visual quality by increasing the number of polygons rendered for some types of curves. Unfortunately, it only works for certain games, and can cause unpredictable results. We recommend that you opt for Always Off for minimal problems.

ANTI-ALIASING (SMOOTHVISION ON THE OPENGL PANEL): To improve the quality of your antialiasing, more samples are needed. 2x AA uses two samples, while 6x AA uses six samples but takes longer to render. We play most games using either 2x or 4x AA, because 6x has too great an impact on frame rates. We don't click Application Preference, because most games don't include built-in settings for antialiasing.



TEXTURE PREFERENCE: Adjusts global texture compression levels. We recommend setting it to the High Quality setting.

MIPMAP DETAIL LEVEL: Mipmaps minimize the distortion that occurs when a texture is stretched from the foreground into the background. A higher mipmap detail level makes for smoother transitions between mipmap levels, but consumes more memory. Move the slider to the right to improve image quality, move it to the left to improve performance. We recommend setting this slider fully to the right because we value visual quality and run high-performance videocards.

WAIT FOR VERTICAL SYNC: This one's simple. If you choose Always Off, you'll have higher frame rates, but might suffer some ugly texture-tearing artifacts. For this reason, we set it to Always On when we're actually playing games, and turn it to Always Off when running benchmarks.

Options

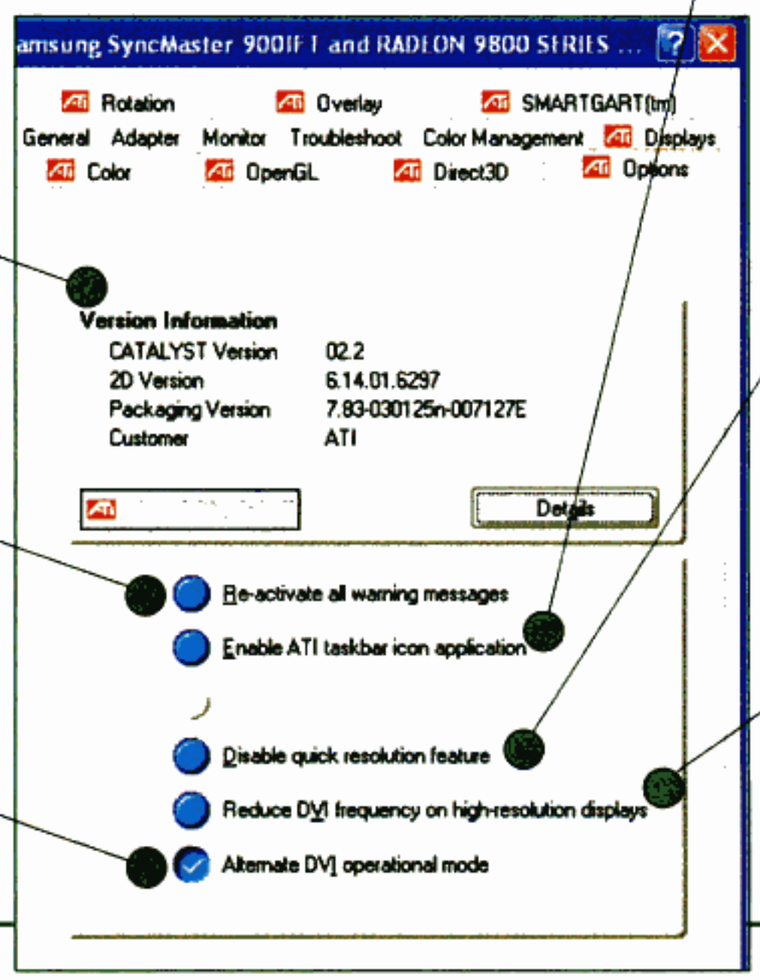
Before updating drivers, you should always swing by the Options tab to make sure you're actually getting a new version.

VERSION INFORMATION: When you're looking at driver revs for ATI cards, you want to pay attention to Catalyst Version and Packaging Version. The Catalyst Version number is the number that will be referenced in ATI's download area. The Packaging Version number is usually part of the driver's actual filename.

RE-ACTIVATE ALL WARNING MESSAGES: Have you ever hit a "Don't bug me about this problem again" checkbox, then wished you hadn't? If the checkbox was in an ATI application, you'll be able to see the warning again by checking this box.

ALTERNATE DVI OPERATIONAL MODE: If you have an old DVI panel or experience problems with your DVI monitor, you might need to check this setting.

ENABLE ATI TASKBAR ICON APPLICATION: Want to get rid of the ATI systray application? Uncheck this box.



DISABLE QUICK RESOLUTION FEATURE: Checking this box forces you to reboot your machine every time you switch resolutions or color depths on your 2D desktop. We recommend leaving this box unchecked.

REDUCE DVI FREQUENCY ON HIGH-RESOLUTION DISPLAYS: If you have a DVI flat-panel that runs a particularly high resolution, you may, in rare cases, need to check this setting in order to eliminate display problems.

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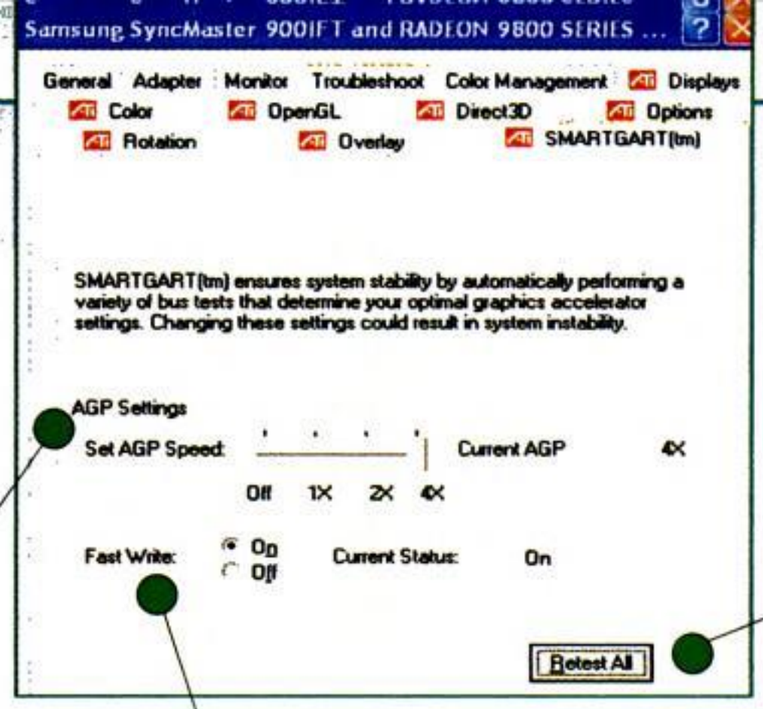
SMARTGART

Most crashes in 3D games are blamed on the videocard, but some are actually the result of motherboard compatibility problems. Because of this, ATI drivers now test your motherboard's AGP compatibility. Once the compatibility tests are completed, the drivers optimize the features in the SMARTGART tab. Still, you can always mess with this stuff if you like.



SET AGP SPEED: Moving this slider to the right enables faster AGP modes; moving it to the left disables the faster modes. Most modern motherboards should support AGP 4x or 8x without crashing.

FAST WRITES: AGP fast writes are part of the AGP 2.0 spec and improve write speeds for all applications that transfer data from the CPU to the graphics chip. However, enabling fast writes can decrease stability if your motherboard doesn't implement the feature properly.

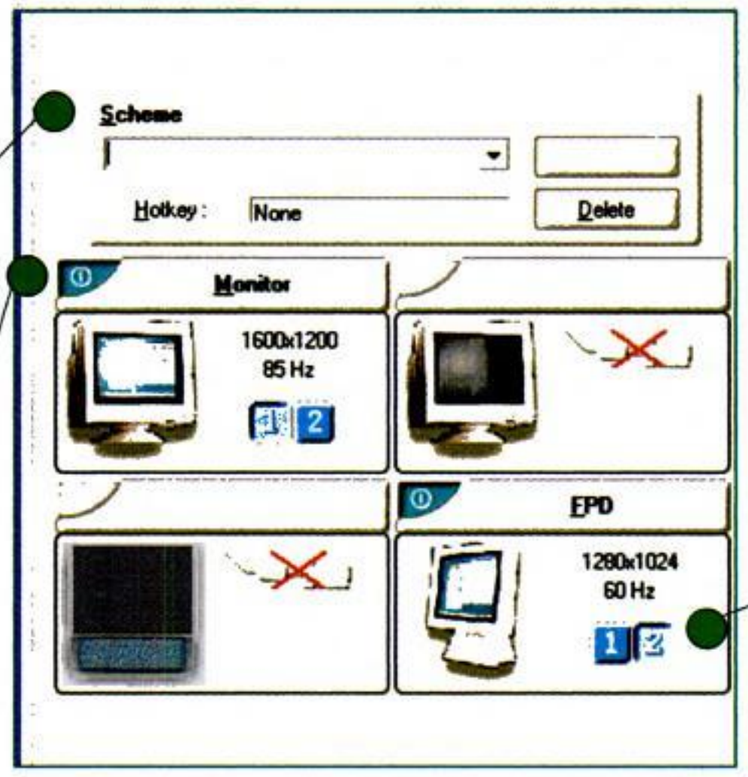
RETEST ALL: If SMARTGART automatically disabled AGP 4x or Fast Writes, but you've since upgraded your motherboard's BIOS or drivers, you can rerun the tests the next time you reboot your PC.

Displays

This tab is of great interest to multiple-monitor users. You can specify which monitor is the primary display, and enable/disable different devices.

SCHEME: Mostly useful for notebook users, you can set different schemes for different display configurations, and set a hotkey to switch to them.

ENABLE/DISABLE A DISPLAY: If a monitor is connected to your PC, and Windows has detected it, you can click this green tab to enable the monitor. In this example, we have detected and enabled one CRT and one flat-panel display (FPD), but not an HDTV using component outs (YPbPr) or a second CRT. Of special interest is the Direct X Override Refresh Rate control for analog monitors, which lets you force a specific refresh rate for Direct3D apps (it's not pictured here, but you can enable it by clicking on the Monitor button).



These little blue buttons let you specify which monitor is the primary display and which is the secondary. The primary display is the starting point for desktop icons, your Taskbar, and splash screens. The primary display is also the only place that most games will work, so we recommend that you make your CRT the primary display.

Overlay, Color & Rotation Tabs

OVERLAY: This tab controls the appearance of video overlays (e.g., TV tuner and some DVD movie overlays). You can manually adjust brightness, contrast, hue, and saturation to make your overlay picture more accurate.

COLOR: Here you can adjust the overall brightness of your desktop, as well as the color curve. You probably don't need to adjust the settings in this tab unless you're a graphics professional and need a color-calibrated monitor. Take a look at our How-To on page 50 for more info on monitor settings.

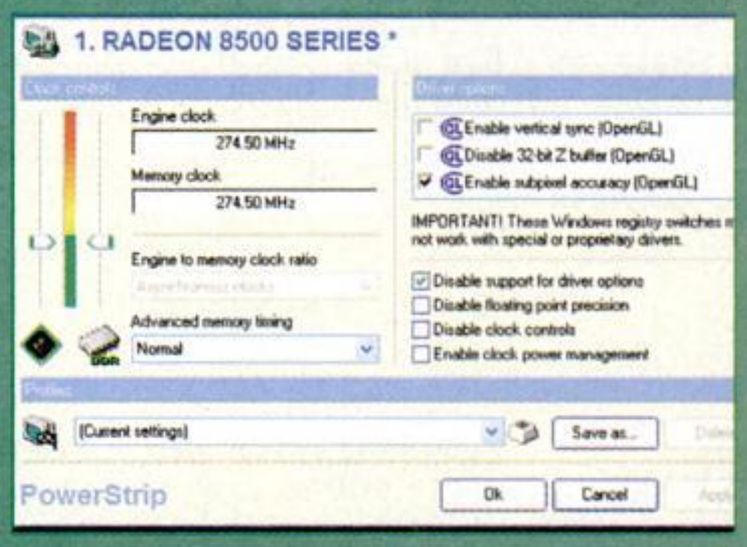
ROTATION: If your monitor is mounted on its side or top, you can use the rotation panel for the proper adjustments, as well as make custom hotkeys to change modes.

PowerStrip: The Ultimate Vidcard Tweaking Tool

Whether you want to overclock your videocard, set up different color profiles for various applications, or just configure a custom resolution and refresh rate for your monitor, *PowerStrip* is the only app for you.

Overclocking your 3D accelerator with *PowerStrip* is as easy as loading the utility and adjusting the Core and Memory sliders in the Performance Profiles panel. *PowerStrip* can even tell if your overclocking attempt went poorly, and will automatically revert your card's speeds to their defaults. You can also force your display to output resolutions that Windows doesn't support. For example, we used the software to force a 1600x1200 option for a 21-inch CRT whose config file we just couldn't find. You can find this feature in the Display Profiles panel under Advanced Timing Options. Look for Custom resolutions, and then add what you need.

As with other advanced tweaking apps, if you don't know what you're doing, you can totally hose your monitor. So if you don't know what a setting does, it's a good idea to avoid changing it—i.e., don't force a refresh rate of 90Hz if your monitor only supports 85Hz.



In the performance panel, you can practice the dark arts.

NVIDIA CONTROL PANELS

A peek at what's hiding in the nooks and crannies

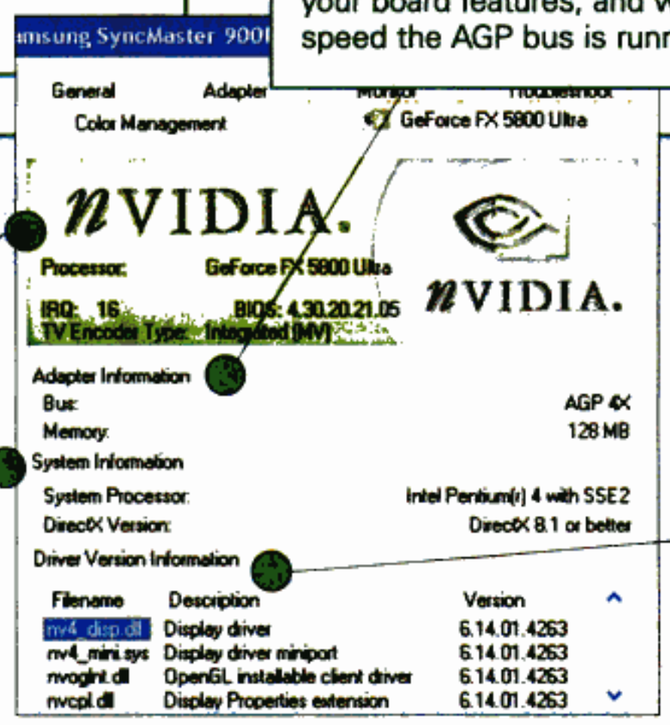
Main Panel

This is the first nVidia panel you'll see, and includes all the important info about your videocard and drivers.

SPLASH SCREEN: This box tells you what type of videocard you have, what IRQ it uses, and what BIOS revision it's running. If your card has a TV output, this screen notes whether an on-GPU encoder or external chip is being used.

SYSTEM INFORMATION: If you don't know what kind of CPU you have, you can check here. The panel also reports what DirectX version you have, although it's not yet adept at recognizing DirectX 9.

ADAPTER INFORMATION: This box tells you how much memory your board features, and what speed the AGP bus is running at.



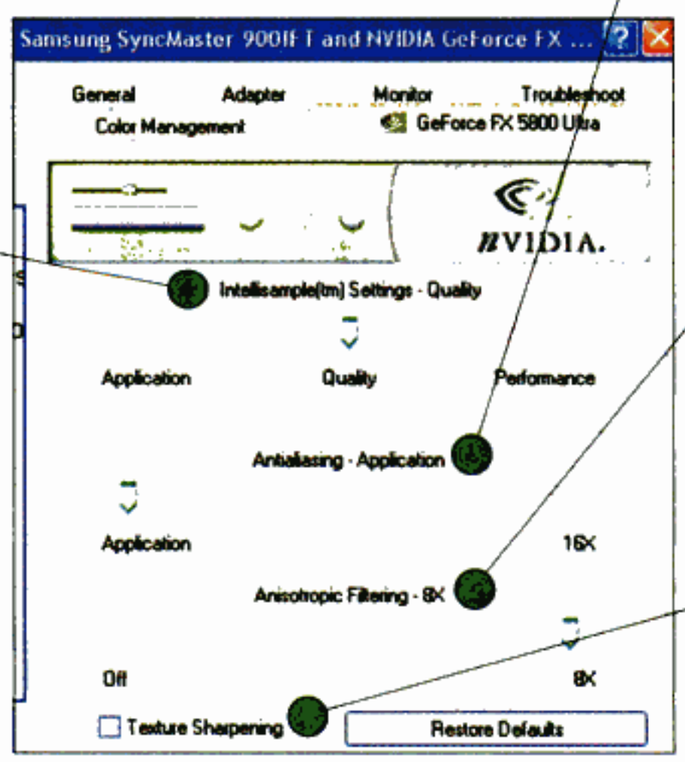
DRIVER VERSION INFO: Pay attention to the last four numbers in the Version column. These numbers correspond to the version numbers listed on nVidia's driver updates page, so you can refer to them to see if a newer driver is online.

Performance

You can adjust image quality and performance in this rather vague control panel. Compared with ATI's panel, nVidia's looks deceptively simple. nVidia says this panel will be redesigned soon to make it less confusing.

PERFORMANCE: The performance slider is confusing, because it doesn't report exactly what it manipulates. It definitely controls texture compression and texture filtering, but nVidia is tight-lipped about details. We do know that the Application setting uses anisotropic and trilinear filtering settings that you define in your 3D game. The Quality setting turns on trilinear filtering, and uses adaptive texture filtering to improve AA and aniso performance, but impacts image quality. The Performance setting sacrifices image quality for raw speed. We recommend you use either the Application or Quality setting for most games.

ANTIALIASING: This slider has eight options. The first option lets the game select the number of samples to use for AA. The second disables AA entirely. The remaining six set different levels of AA; as you move from left to right, image quality improves (as performance takes a hit).



ANISOTROPIC FILTERING: nVidia cards offer three levels of anisotropic filtering. We recommend running with the 8x aniso setting for the best image quality, or no AF at all for maximum performance.

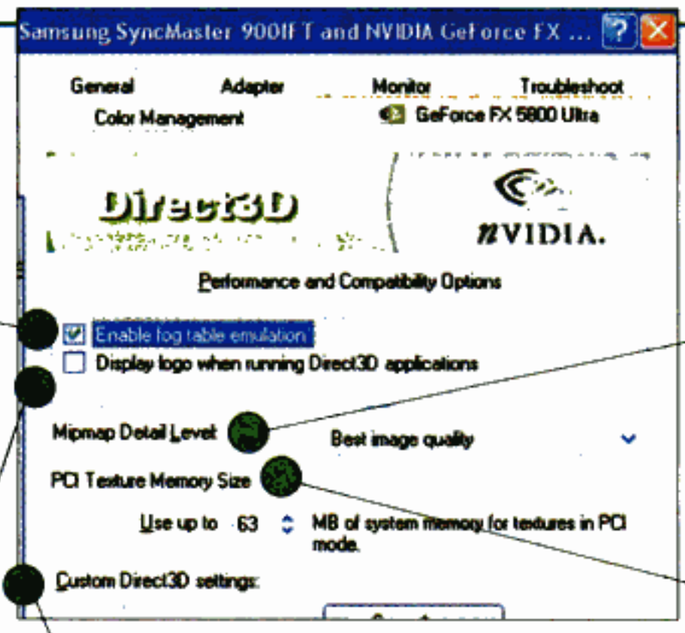
TEXTURE SHARPENING: This setting apparently sharpens textures (by unexplained means) when AA is enabled. Or at least that's what the control panel reports. Strangely, according to an nVidia press kit PDF, the setting is meant to complement enabled aniso settings.

Direct3D

Here you'll find some deeper controls for your Direct3D graphics.

ENABLE FOG TABLE EMULATION: Using fog tables is an old-school Direct3D approach to preventing your game from trying to draw more than your videocard is capable of rendering. Fog tables create a wall of fog somewhere between the camera and the horizon. Turn on this option for maximum compatibility with older 3D games.

DISPLAY LOGO WHEN RUNNING DIRECT3D APPLICATIONS: Don't enable this option unless you want a small Direct3D "bug" in the lower right corner of your screen.



CUSTOM DIRECT3D SETTINGS: Here you can create and save profiles based on the settings you define in this control panel.

MIPMAP DETAIL LEVEL: In apps that are memory bandwidth–limited, you can juice significantly better benchmark scores by lowering your mip-map detail level. We feel that the image quality hits can be too much to take, but your mileage may vary.

PCI TEXTURE MEMORY SIZE: This setting does absolutely nothing, unless you're running a PCI videocard. If you're unfortunate enough to have a PCI card, this will control the amount of system memory that is used for textures.

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OpenGL

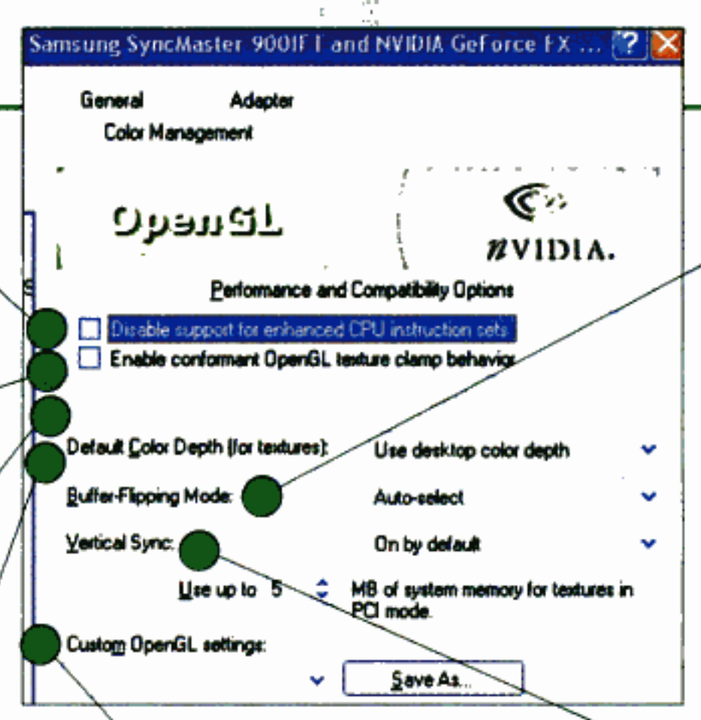
All your OpenGL-specific options can be found here.

DISABLE SUPPORT FOR ENHANCED CPU INSTRUCTION SETS: We can't imagine why anyone would want to disable SSE2 and 3DNow!, but there's an option to do just that.

ENABLE CONFORMAT OPENGL TEXTURE CLAMP BEHAVIOR: This option controls the way OpenGL handles textures that run off the sides of their polygons. Enable this if you experience misaligned textures in OpenGL games.

MULTI-DISPLAY HARDWARE ACCELERATION: Setting this to Multi-Display mode will let you run OpenGL apps on either screen in a dual-monitor rig.

DEFAULT COLOR DEPTH (FOR TEXTURES): We recommend setting this to 32-bit for maximum image quality. Setting it to 16-bit can improve performance, but will cause banding in most 32-bit games.



BUFFER-FLIPPING MODE: This controls the method used to swap rendered scenes from the frame buffer. We recommend using the Auto-select setting for maximum compatibility.

CUSTOM OPENGL SETTINGS: Here you can create and save profiles based on the settings you define in this control panel.

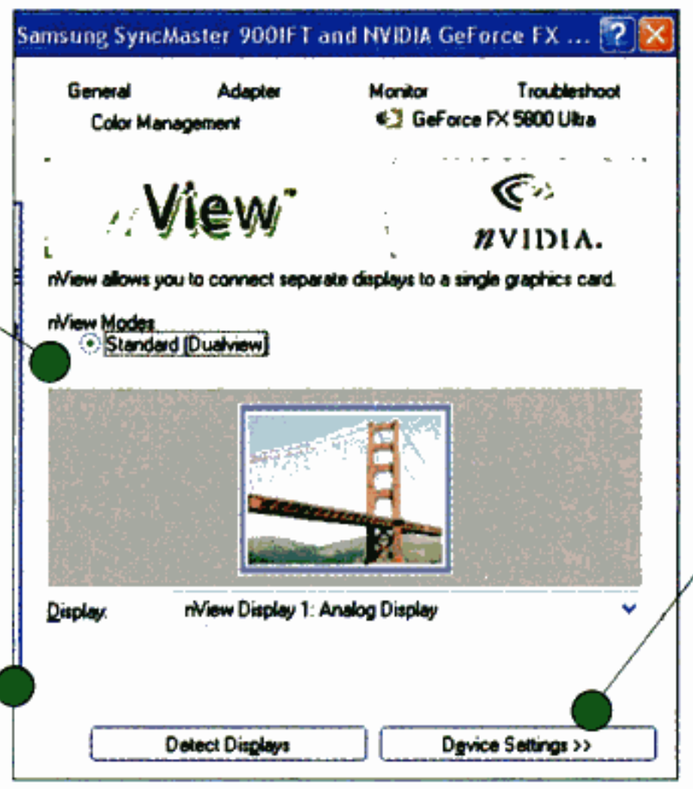
VERTICAL SYNC: Unless we're running benchmarks, we like to leave vsync on by default. Disabling it can cause tearing and other visual artifacts.

nView

In this tab you can control numerous options for running multiple-monitor setups.

NVIEW MODES: Choosing the Standard (Dualview) mode configures your second display as a separate, independent monitor set to its own custom resolution and refresh rate. You can define your first display as the Primary display by selecting it and checking the box below (your Primary display will contain your Taskbar and default Desktop icons). Choosing Clone puts the exact same image on both monitors (both displays need to be set to the same resolution, bit-depth, and refresh rate). In Horizontal Span mode, your entire desktop will be spread across the two monitors. Windows will see the two displays as one double-wide monitor. Both monitors must run at the same resolution and refresh. Vertical span works like horizontal span, but instead of a double-wide monitor, Windows sees a double-tall monitor.

DISABLE AUTO-PANNING: Used when cloning your main display to a secondary display with a lower resolution, such as a TV. When you check this box, the display on the low-res screen won't follow the mouse cursor if it moves outside the viewable area.



DEVICE SETTINGS: This button gives you access to things such as image adjustment on the monitor. Most users won't need to adjust anything in that panel.

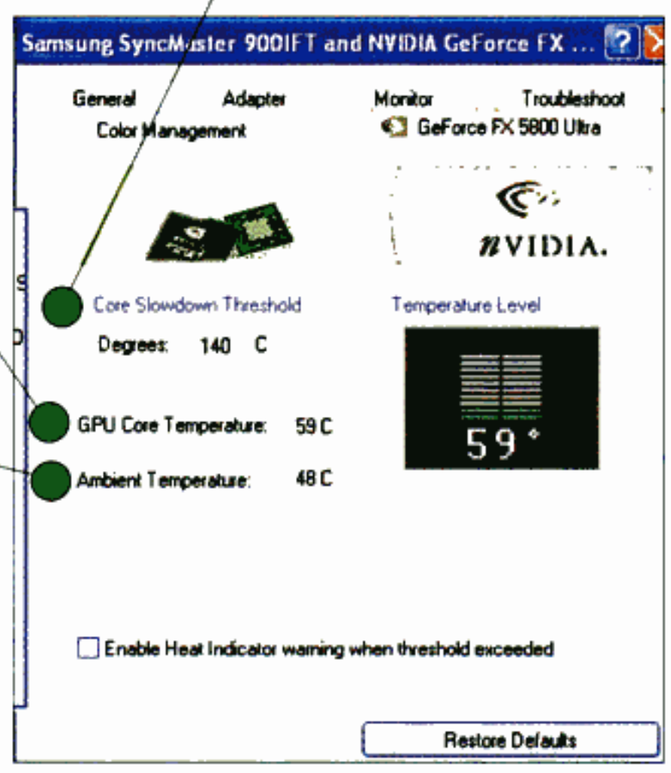
Temperature Settings

The GeForce FX chip has a temperature sensor built into its core. When the core begins to overheat, the GPU automatically slows down so that no damage is done.

CORE SLOWDOWN THRESHOLD: When the core temperature goes above this value, the GPU throttles down so it can cool off.

GPU CORE TEMPERATURE: The current temperature inside the core.

AMBIENT TEMPERATURE: The current temperature on the far edge of the board. This should be representative of the temperature inside your case.



Desktop Utilities & More

DESKTOP UTILITIES: Within this tab, you can disable the annoying system tray icon, and enable advanced nView functionality.

OVERLAY CONTROLS: Here you can adjust various image-quality settings for video overlays used by hardware DVD decoders and some TV tuners.

REFRESH RATE OVERRIDE: To force a refresh rate in Direct3D apps, go to this subset of the Direct3D control panel, and set the refresh for each resolution and bit-depth you play at. If you don't specify the refresh rates you use in either the control panel or your game, you'll likely default to 60Hz in games.

COOLBITS: By adding a registry DWORD called Coolbits to HKEY_LOCAL_MACHINE\SOFTWARE\NVIDIA Corporation\Global\NvTweak, and setting the value to 3, you unlock nVidia's own clock-tweaking program. The new tab will let you adjust the clock speeds of your nVidia-based 3D accelerator.

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VIDEOCARD Q&A

We answer our readers' most frequently asked questions

I don't have an AGP slot. What is the best PCI videocard?

There aren't any cutting-edge PCI videocards anymore, so you'll have to make do with the PCI versions of the nVidia GeForce4 MX 440 or MX 460. The MX boards eschew programmable shaders and other advanced features that are crucial for upcoming games, but even the PCI versions of these cards should be faster than most 3D graphics integrated into today's mobo chipsets, such as the nForce2 (see page 18 for details).

What are the compelling reasons to buy a 256MB videocard?

The extra 128MB of RAM on the upcoming 256MB version of the Radeon 9800 Pro won't give you any tangible performance boost in today's games—most current games aren't complex enough to fill that much memory. But having 256MB should really improve performance in upcoming games like *Doom III* and *Half-Life 2*, as well as current synthetic benchmarks, such as *3DMark2003*.

How come do-everything cards don't include HDTV decoders?

Current do-everything cards, like the All-in-Wonder 9700 Pro, don't include HDTV decoders because no one has made an "HD tuner-in-a-can" (this is what board engineers call that metal box on TV tuner cards) that would be suitable for use on a videocard. Designing a new tuner can isn't a trivial process, and there hasn't been a large enough HDTV market to make it worthwhile. Still, we are hearing rumors that HDTV tuners may hit the do-everything scene later this year or early next year. We'll keep you posted.

What are the main differences between workstation and gaming cards?

The two main differences between workstation and gaming cards are raw speed and drivers. Current gaming cards actually have faster core and memory speeds than equivalent workstation cards because raw fillrate is vital to gamers, but secondary to workstation users.

As for drivers, workstation cards ship with not only OpenGL and Direct3D drivers for gaming and some content creation apps, but also specialized drivers that have been scrutinized and qualified for high-end content creation apps like *AutoCAD* and *Maya*. These drivers stress pixel precision and rendering accuracy over performance. A mis-drawn pixel in *AutoCAD* can cause expensive problems when you're designing an airplane or a car engine, but a few errant pixels won't have an equally ruinous effect on your *Castle Wolfenstein* experience. Because qualifying a workstation card and its drivers for numerous different design apps is so time-intensive, the costs for qualification are passed along to the consumer in the form of expensive hardware.

That's not to say that you can't run an app like *3ds max* with your gaming card. It will run just fine. In fact, for an application like *3ds max* (which is used to design the 3D models in games) render-accuracy is less important than speed, and most current gaming cards ship with very good OpenGL and Direct3D drivers.

What are the differences among my DB-15, DVI, component-out, composite-out, and S-video connectors?

The DB-15 output is what you're probably most familiar with. It takes an analog signal from your videocard, and carries it across a 15-wire cable to your display. DB-15 cables can carry ultra-high resolution images. DVI is the digital equivalent of DB-15, and is used primarily for LCD flat panels but can run out of bandwidth when dealing with resolutions higher than 1600x1200. Fortunately, there aren't that many LCDs that run at a higher resolution than that.

Component outputs are used for high-quality analog image transfers from consumer electronics devices—such as game consoles and DVD players—to televisions. Some videocards, specifically the Radeon series cards, can output high-quality PC images to an HDTV using component outputs. Composite and S-video are similar to each other. They're used for low-quality video between consumer electronics devices. S-video produces a better image than composite, because it separates luminance and chroma information, and this reduces distortion.

Are hardware DVD decoders necessary any more?

We last did image-quality testing between hardware and software DVD decoders in 2001. We grabbed staff members and showed them a side-by-side comparison of video rendered with a hardware decoder and the then-current version of *WinDVD*. We surveyed 15 different people, and only one preferred the hardware decoder to the soft DVD decoder. There's no reason to use a hardware decoder in this day and age of fast CPUs and videocards with built-in motion compensation.

Is there a time frame by which all 3D games will use programmable shaders?

There isn't a fixed deadline by which all games will use programmable shaders. Developers have shied away from programmable shader games because there's a relatively small installed base of programmable cards (GeForce3 and better). However, more games are using bump maps and shader-powered shadows every day. Developers are also learning how to use shaders and still maintain backward-compatibility with older cards without programmable shaders. This summer and fall, we'll see programmable shader boards available for less than $100. This will increase the installed base of programmable shader cards, and make developing shader games more attractive to game companies.

Are any of today's integrated chipset graphics capable of playing *Doom III*-caliber games?

Maybe, but certainly not with all the whiz-bang features enabled. If you want to see stencil shadows, reflections, and fancy-schmancy bump maps (basically, all the features that will make *Doom III* the most revolutionary game since the first 3D-accelerated version of *Quake*), you'll need a card with programmable shaders, such as the Radeon 9700 Pro or GeForce FX 5800.

What will nVidia and ATI release in their next refresh cycles?

We could tell you shocking details, but then we'd have to kill you. ATI's next product release should be the R400, which will include a substantial number of new features and silicon on the chip.

What will be the minimum *Doom III* system requirements?

The developers haven't yet announced minimum system specs for *Doom III*, but judging from the screenshots and demos we've seen, we'll hazard that you'll need a board with hardware T&L to even run the game, and at least a Radeon 8500 or GeForce3 class board to turn on any fancy special effects. If you want to turn on all the shadows and bump maps, you'll want a Radeon 9700, GeForce FX, or newer board. On the CPU front, faster is always better, but we're guessing that anything 2GHz or greater will be acceptable.

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We'd expect it to be on a 0.13-micron process and use DDR-II memory. nVidia's next GPU is code-named NV35, and we expect it to be a faster version of the GeForce FX. Stay tuned...

What are the basic strategies for videocard overclocking?

First download and install *PowerStrip* (**www.entechtaiwan.com/ps.htm**), then right-click the icon in your systray, and go to Performance Options, then Configure. You can increase both the memory and core clocks of your board from this panel.

When you're testing your board to find its overclocking limits, try just one segment of your board at a time. We usually start with the core clock. Bump it up in 5MHz increments, then test your frequency bump using a game or benchmark—*3DMark2003* and *Unreal Tournament 2003* are good tests. Keep upping the clock speed and running your tests until you begin to see visual corruption, then set the clock back down to the last speed you tested without problems. After adjusting your core speed, do the same for the memory clock.

The best way to test long-term stability is to play games on your computer. If your overclocked PC can withstand a three-hour *Battlefield 1942* or *UT2003* session, it's stable. If you have stability problems with your overclocked rig, the first thing you should always do is crank back the overclocking. Some applications are notoriously sensitive and just won't run on overclocked components. Of course, it also pays to make sure your videocard is sufficiently cooled. Thermaltake (**www.thermaltake.com**) makes a wide selection of aftermarket videocard coolers for both GeForce and Radeon.

What's the proper way to ground myself when installing a new videocard?

After you've turned off your PC, but before you unplug the power cord from the power supply, touch a piece of metal on your case frame. Grounding yourself is really that simple.

In order to run a GeForce FX or Radeon 9800, what size power supply must I have?

Your power supply size is dependent on the number of hard drives and optical drives you have in your system, the speed and type of CPU you have, and your 3D accelerator. For systems with only two or three drives, we haven't had any problems running a Radeon 9800 or GeForce FX with quality 350W or higher power supplies.

How often should I update my drivers and DirectX versions?

We recommend you update your videocard drivers when they're released. New drivers can improve performance and stability, which is something everyone wants. New revs of DirectX are a little different, though. We recommend that

Continued on page 36

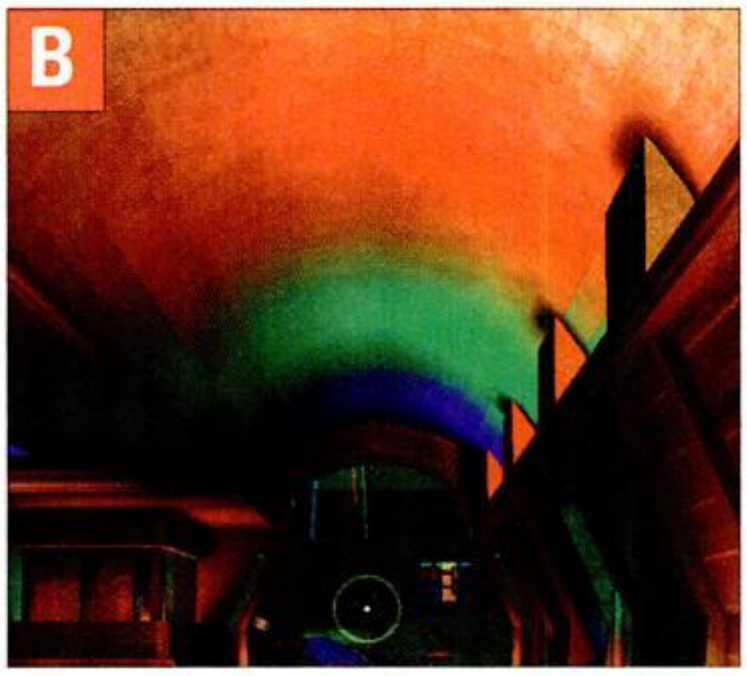
What are the differences between bilinear, trilinear, and anisotropic filtering?

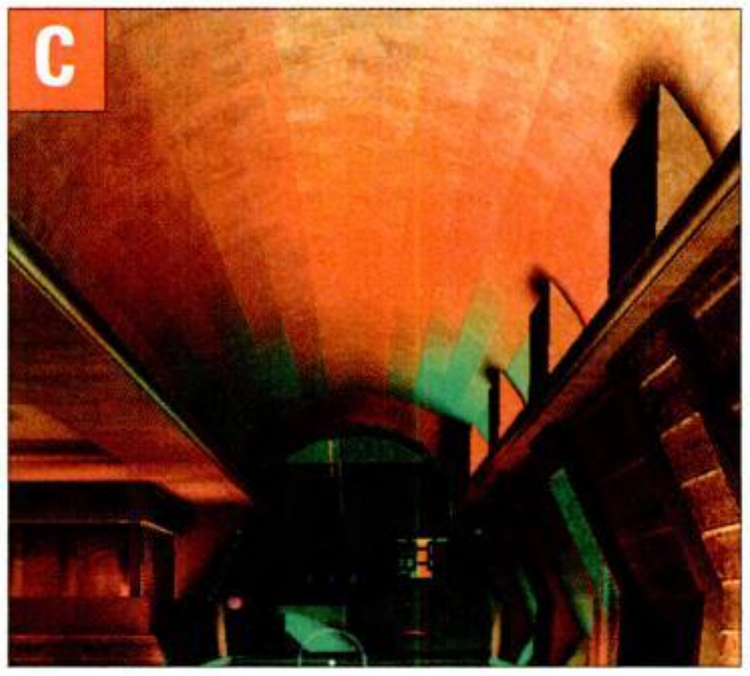
Each filtering strategy is designed to make the bitmap textures stretched over polygons look more realistic. If 3D objects and environments weren't filtered, there would be ugly seams between textures, and textures would often appear distorted when wrapped around models. But filtering strategies also have an important relationship to mipmaps.

Mipmaping is a technique that generates different levels of quality for the same texture. For example, when you stand stationary in a 3D scene, the textures stretched over objects in the background are low-res, low-quality mipmaps, and the textures stretched over objects in the foreground are high-res, high-quality mipmaps. As you walk forward in the scene, and begin to get closer to the previously faraway objects, those objects' low-res mipmaps are replaced by higher-res versions. This rendering strategy is helpful to frame rates because low-res, low-quality textures demand less memory bandwidth than higher-quality textures. But here's the rub: The demarcation lines between mipmap levels of varying quality can be visually distracting if they're not adequately filtered.

To give you a better idea of how the different filtering modes affect mipmaps in 3D games, we fired up *Quake III,* and set it to show different mipmaps in "false colors" (the command is "r_colormiplevels 1" if you want to try for yourself). In the pictures you see here, each mip level appears as a different color. The first level represents the highest texture quality, and has normal color. The second mip level represents slightly lesser texture quality, and is red. And then the ever-degrading levels cycle accordingly through green, blue, and back to red again.

Image A shows what happens to mipmaps when only bilinear filtering in enabled. Notice that there's no blending between different mipmap levels. In image B, trilinear filtering is enabled. Note that the transitions between mipmap levels are smoothly blended—this eliminates the visible seams between mipmaps. Image C shows what happens when anisotropic filtering is added to trilinear filtering. With aniso on, the mipmaps are perspective-corrected. This creates a somewhat ugly stairstepping effect when viewed in false color, but aniso improves visual realism in normal color, especially when you're moving around. Just note how much more of the tunnel is using the higher-quality red mipmap instead of the lower-quality green mipmap.





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VIDEOCARD ANSWERS

Continued from page 35

you not install a new version of DirectX until you try to play a game that requires it. There's just no reason to upgrade if you don't have to. Regardless, we don't expect to see DirectX 10 until Microsoft ships the next version of Windows in late 2004 or early 2005.

How can I tell if a given game uses DirectX or OpenGL?

Two or three years ago, choosing between OpenGL and DirectX could make a big difference in performance. However, in these enlightened times, 3D card manufacturers have mature, robust drivers for both Direct3D and OpenGL, so it doesn't really matter which API your game uses for rendering.

Why can't software and hardware vendors create products that run flawlessly on any system that has DirectX installed?

Software developers write games using DirectX code, and hardware vendors create hardware and write drivers that can read the DirectX code and run it on their silicon. The DirectX hardware specs and the software APIs are precisely laid out, but the real problem comes from shoddy hardware drivers. Because the drivers need very low-level access to your system for performance reasons, if they're buggy or misbehave, they're much more likely to make your system crash. The solution is for hardware manufacturers to make better drivers and perform more extensive testing before releasing them to the public.

I'm experiencing random crashes in games. What's my basic troubleshooting strategy?

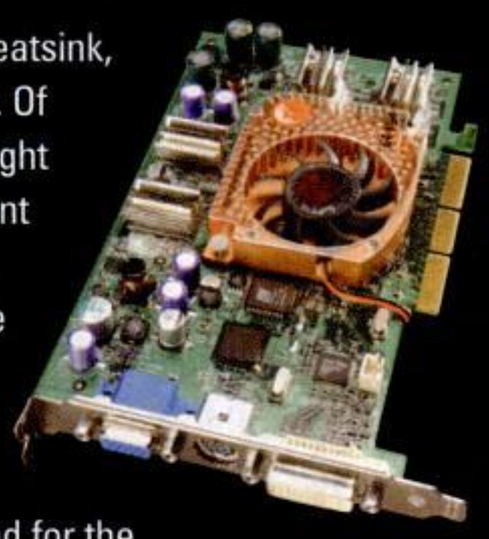
First, if you're overclocking anything in your system, stop. Even slight overclocking can cause instability. If that doesn't fix your problem, then go to your motherboard or system vendor's web site, and get their latest motherboard chipset drivers (do *not* confuse chipset drivers with a BIOS update). Install the chipset drivers, making sure you reboot as prompted. Now install the latest videocard drivers appropriate to your videocard—most likely from ATI.com or nVidia.com. Updating these two drivers in this order will fix 90 percent of all crashes in games.

If you still have problems, you should open your PC and make sure that you've got good airflow around the videocard, and that its onboard fan is working properly. You should also ensure that your finicky game doesn't have known issues with your 3D accelerator by checking the game's support page (the URL is usually listed in the game manual). Install game patches if they're available. Finally, don't rule out other components, such as your network card or soundcard.

I get errors when I try to play some new games, but my computer meets all the games' system requirements. What's wrong?

The system requirements listed on the side of game boxes aren't always accurate. Frequently, a game will state that it requires a 32MB 3D accelerator, but what that really means is that you need a 3D accelerator with hardware T&L. For the record, all the GeForce and Radeon lines include hardware T&L. As we move forward, expect to see games that require programmable shaders support too!

Can noisy videocard fans be replaced? What do you recommend as replacement fans?



It's easy to replace your fan and heatsink, assuming it's not glued to the GPU. Of course, you also have to buy the right parts. Our favorite GPU replacement coolers are made by ThermalTake (www.thermaltake.com). They're easy to install, work great, and come in many different sizes and speeds. For a GeForce4 card, we recommend an A1349, and for the GeForce3, we'd use the A1178 (Crystal Orb). You'll also need a tube of thermal compound, such as Arctic Silver. We've not found an aftermarket Radeon cooler that we're pleased with.

To swap the fans, first disconnect the original fan's power lead from the onboard power socket. Next, use a pair of needle-nose pliers to remove the plastic pins that hold the fan to the board. Now gently pull the heatsink off of the board. Use 90 percent rubbing alcohol to remove the remnants of the thermal tape that was affixed to the old fan. When the alcohol is dry, apply a thin layer of Arctic Silver to the GPU, and mount the new fan to the GPU using the plastic pins you removed from the old fan. Now attach the new fan's power supply.

I'm running my favorite game with all its effects turned to the max—and it's dog slow. What's your expert opinion on which visual settings should be set to the max whenever possible?

The easiest way to increase frame rates is to lower your resolution. For example, at 1600x1200, the minimum number of pixels that your 3D card will draw per frame is 1.92 million. And, if you enable antialiasing, texture filtering, and other features, your card will draw considerably more than that. In contrast, at 640x480 the minimum number of pixels the card draws is about 307,200. Even at 1024x768, the card draws only about 800,000 pixels. The upshot is that lowering your resolution might even allow you to run all the fancy visual effects at full blast.

If running at low resolutions is anathema to you, try disabling antialiasing and anisotropic filtering. Both of those features are performance hogs. Decreasing texture quality and turning down the number of mip-map levels can further increase performance, but they will also severely impact your image quality.

Which drivers should I use, those created by the GPU company or the card company?

As a general rule, the "reference drivers" produced by the company that makes your GPU are newer than those released by your card's manufacturer. That means they'll be faster and include more bug fixes and optimizations than the drivers from the card company. The only reason *not* to run a reference driver is if your card has some sort of special feature, such as video capture or 3D glasses, which simply won't work with the reference driver.

What is the lowest refresh rate I should be running?

For CRTs, any refresh rate less than 75Hz is too low. Higher refresh rates are better for your eyes and won't give you the blinding headache that comes as a result of screen flicker (see How-To on page 50). DVI flat panels are a slightly different story because they don't have a refresh rate, per se. Your DVI panel will likely default to 60Hz, and that's just dandy.

What is the lowest frame rate I should run games at?

Competitive gamers generally want to maintain an average of 60fps. There are two reasons for this. First, some twitch multiplayer games (like first-person shooters) can update the player's position, what he's shooting at, and what direction he's moving only when a new frame is drawn. That means that running a faster machine actually gives a gamer an advantage in a deathmatch. Luckily, most modern shooters fix this and render the scene independently of network data.

Second, it's difficult for game developers to fix a game at a single frame rate. It's easy to cap the maximum frame rate, but the minimum frame rate is determined by the complexity of the scene that's being drawn. So, by targeting an average frame rate of 60fps, it's unlikely that the actual frame rate at any point during a game will drop below 30fps. And 30fps is the sweet spot. ■

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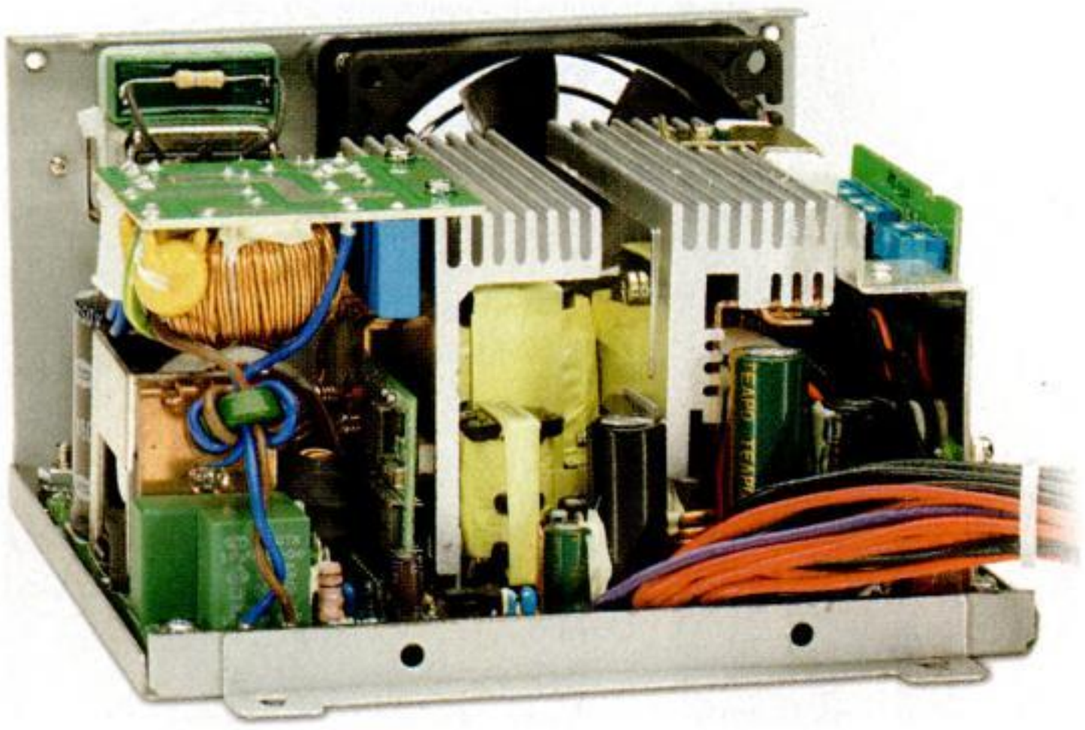
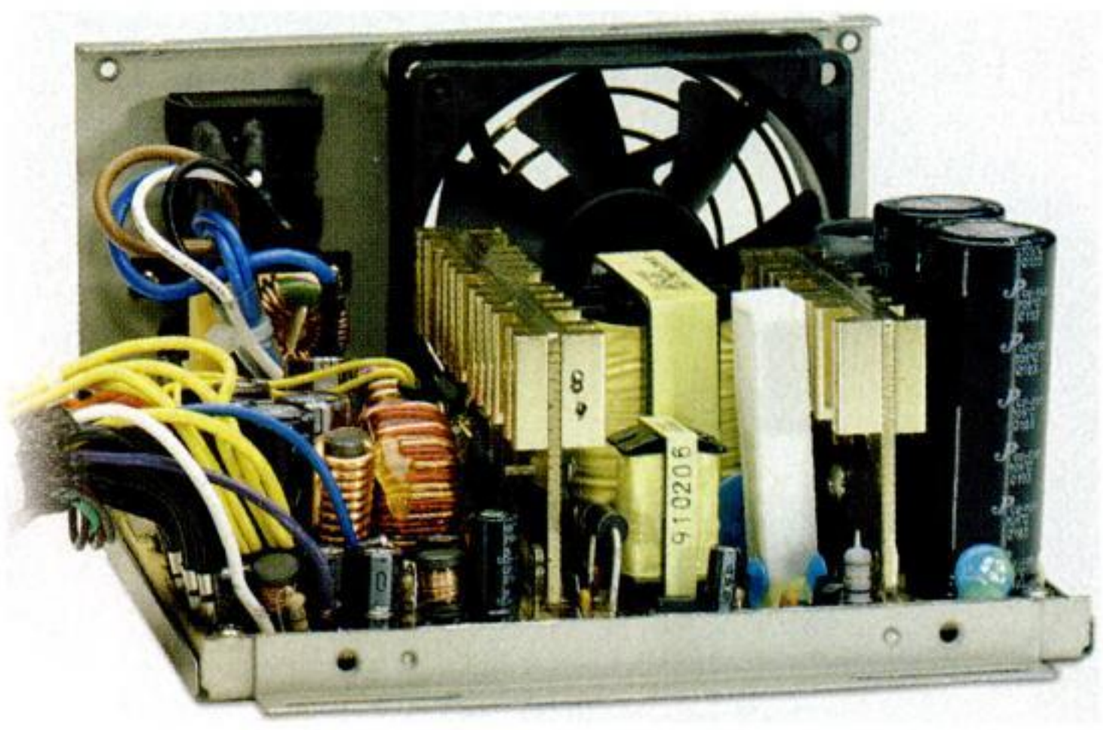
The Inside Story on Power Supplies.

Turbo-Cool® 510



So-Called 550

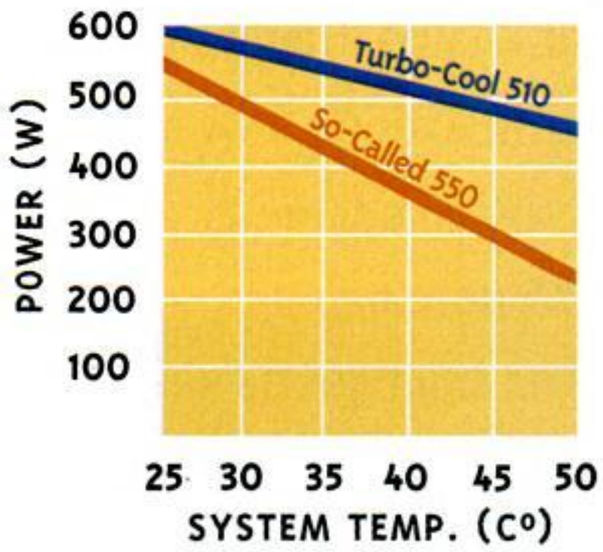


Power @ 25°C:	**600W**	**550W**	Rating requires room temp. < 60°F
Power @ 40°C:	**510W**	**366W**	40°C is the temp. inside a typical PC
Power @ 50°C:	**460W**	**244W**	50°C is the spec for an industrial PC
+12V Output:	**34A**	**24A**	Powers the processor(s) and drives
Regulation:	**1%**	**5%**	Maximum voltage fluctuation
System Cooling:	**44 cfm**	**40 cfm**	Tests show second fan is ineffective
Active PFC:	**Yes**	**No**	Continuous range line conditioning
Voltage Pots:	**Yes**	**No**	Adjustments for system imbalance
Intel Approved:	**Yes**	**No**	Turbo-Cool 510 tops Intel's ATX12V list
Warranty:	**5-Years**	**1-Year**	Reliability and longevity indicator

Turbo-Cool® 510 is the Expert's Choice.

Turbo-Cool power supplies have powered Maximum PC's Dream Machines for the last five years and are recommended by motherboard manufacturers such as Asus, SuperMicro, Tyan, and Intel.

Don't be Mislead by Wattage Claims!



*Even though the ambient temp. inside a loaded PC is at least 40°C (104°F), most manufacturers unrealistically assume 25°C (77°F) in order to exaggerate their wattage claims. Since the proper full-load rating is 15°C higher, these power supplies produce **33% less power** than their advertised ratings as shown on the derating chart.*

Turbo-Cool 510 derating spec: *full load @ 40°C, decrease to 90% load @ 50°C.*
So-Called 550 manufacturer's spec: *full load @ 25°C, decrease to no load @ 70°C.*

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Once again,
Maximum PC is proud to host...

The 3rd Annual GEEK Quiz

Things may be different in Hollywood, but in Geekville, it's not *who* you know, it's *what* you know. So let's hear it: Are you ready to go up against the propellerheads of *Maximum PC* and find out how you measure up?

Yes, it's that time of year again—time to stop talking smack and begin showing the world exactly how much you know about PCs, their architecture, components, and standards. Find your place on the geek continuum by answering 70 questions that run the gamut from gentle newbie brain teasers to insanely arcane digital mind benders.

You'll find the correct answers at the bottom of the page. Tally your results, and then take your place in one of the four tiers of historical Geekdom. Good luck climbing the ranks!

1 Which of the following motherboard formfactors places PCI cards parallel to the motherboard?

A FlexATX
B NLX
C CustomATX
D MicroATX

2 Which 3D accelerator uses fragment anti-aliasing to maximize AA quality for a minimal performance hit?

A Matrox Parhelia
B SiS Xabre
C ATI Radeon 9800 Pro
D nVidia GeForce FX 5800 Ultra

3 How many wires are in a Serial ATA data cable?

A 4
B 5
C 6
D 7

4 What's so special about the Itronics GoBook MAX?

A It's waterproof
B It was the first widescreen laptop to hit the PC market
C It supports IMAX audio and video codecs
D It can withstand a drop onto a hard surface from 133 feet

5 What are the stock core and memory clocks of the GeForce FX 5800 Ultra boards?

A 400MHz/400MHz
B 525MHz/500MHz
C 500MHz/500MHz
D 500MHz/525MHz

6 802.11g wireless networks work in what frequency range?

A 2.4GHz
B 5.2GHz
C 2.4MHz
D 5.2GB

7 Which of these is *not* a real or proposed standard?

A 802.11c
B 802.11a
C 802.11r
D 802.11g

16-b, 17-a, 18-a, 19-c

8 **What's the resolution of the Logitech MX700 optical mouse?**

A 600dpi
B 800dpi
C 400dpi
D 1600dpi

9 **How much total bandwidth will PCI-Express For Graphics have?**

A 4GB/sec
B 8GB/sec
C 10GB/sec
D 12GB/sec

10 **Windows XP is based on:**

A Windows NT
B Windows ME
C Windows 95
D Windows WP

11 **DVD 1x is equivalent to what CD performance rating?**

A 2.4x
B 8x
C 9x
D 11.08x

12 **One company's optical drive leaves the station going 40mph. Another company's optical drive leaves the station going 30mph. But which company doesn't have any optical drives leaving any station any more?**

A Lite-On
B Samsung
C Asus
D Yamaha

13 **A Blu-ray disc holds how much data?**

A 4.7GB
B 9.4GB
C 27GB
D 36GB

14 **How much space does Windows XP's Recycle Bin consume on a default install of XP Home?**

A 10 percent of your drive
B 5 percent of your drive
C 15 percent of your drive
D None of the above

15 **Using glass or plastic-fiber shielded twisted pair (STP) cables, FireWire 1394b offers what maximum throughput?**

A 400Mb/sec
B FireWire b doesn't support glass or plastic-fiber cables
C 1.6Gb/sec
D 800Mb/sec

16 **The wavelength of a blue-violet (Blu-ray) laser is:**

A 385nm
B 405nm
C 630nm
D 650nm

17 **Let's say your CRT monitor can't exceed a refresh rate of 80Hz at 1280x1024. As a result, you won't get more than 80fps from your 3D games unless you:**

A Disable vsync
B Enable anisotropic filtering
C Disable full-screen antialiasing
D Have a 52x CD-ROM drive

18 **What does Intel's new CSA stand for, and what does it do?**

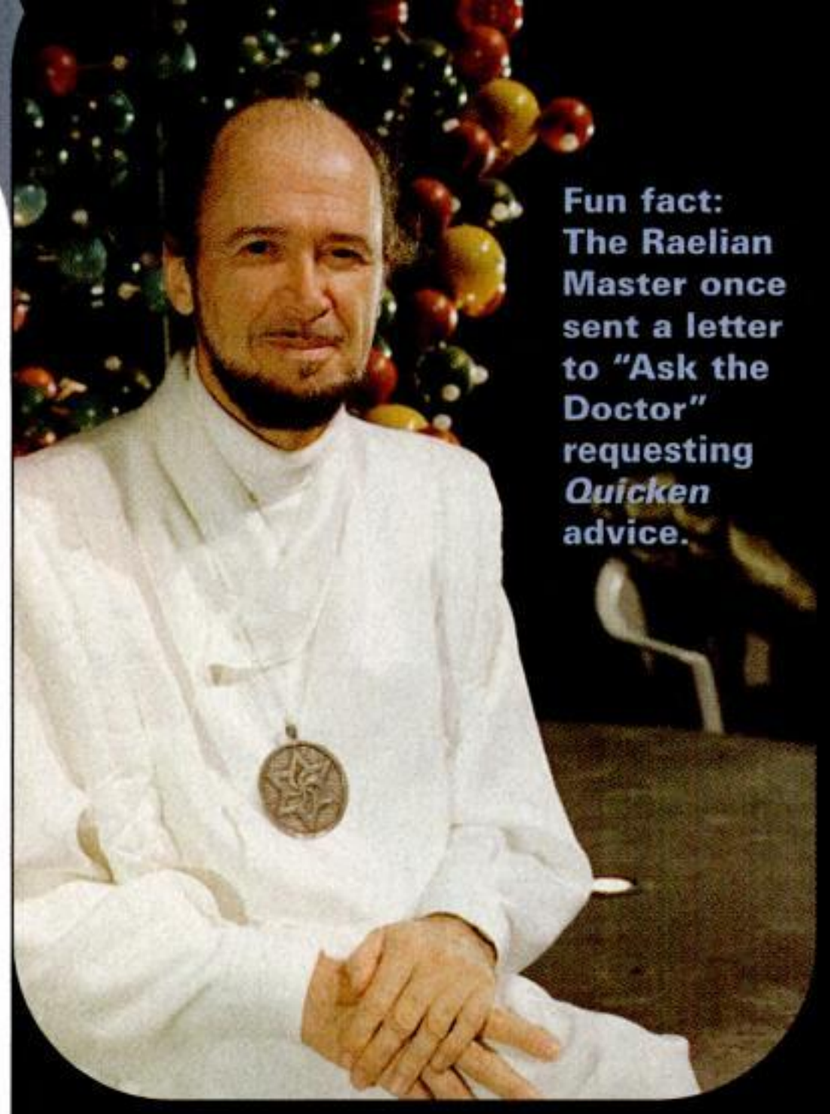
A Communications Streaming Architecture. It creates a dedicated port in the memory controller hub for networking
B Communications Subsystem Analyzer. Part of the new Pro/1000MT chipset, this ensures data integrity by using the P4 to implement advanced CRC checking
C Compatibility System Architecture. This will ensure that Intel chipsets and CPUs are manufactured for three years to satisfy most corporate IT programs
D Compression Streaming Algorithm. Uses SSE2 within the Pentium 4 to increase network traffic by highly compressing data packets

19 **An I/O Shield is:**

A A hardware firewall to protect data on your PC from the Internet
B The shielding that surrounds each individual wire in a parallel ATA cable to help prevent RF interference and increase I/O throughput
C The metallic rectangular plate through which you route your system I/O ports
D The bracket that clips onto a Pentium 4 CPU

Answers: 1-b, 2-a, 3-d, 4-a, 5-c, 6-a, 7-c, 8-b, 9-b, 10-a, 11-c, 12-d, 13-c, 14-a, 15-c,

RAELIAN AND C 3PO PROVIDED BY GETTY IMAGES



Fun fact: The Raelian Master once sent a letter to "Ask the Doctor" requesting *Quicken* advice.

TIER 1 GEEKDOM

Zero to 18 correct answers

Most Tier 1 Geeks actually want to be Tier 4 Geeks. But unfortunately for them, they got saddled with all the weirdness, and awkwardness, and unpleasant personality tics of classic Tier 4 Geeks, but without any of the smarts. The Tier 1 Geek is that guy you meet at a party who insists on arguing ad nauseam about the relative merits of ATI's drivers, but calls them "cataract drivers" every single time, without a trace of irony. The Tier 1 Geek is that script kiddie who feels like a badass when playing with a virus generator, but runs for cover when one accidentally runs amok.

The worst kind of "What does this button do?" disasters always spring from the Tier 1 Geek's desktop, and almost every motherboard China Syndrome was caused by a Tier 1 Geek armed with nothing but a processor, a heatsink, very little talent, and lots of idle time. So if you find yourself scoring somewhere in the Tier 1 category, take a good look at your stablemates and ask yourself, "Is this what I want to be like?" Then hit the books, grasshopper, and climb your way up to Tier 2.

The Tier 1 Pantheon of Shame—They Seem "Sciencey" But They're Really Not: Raelians, Thomas Dolby, Milhouse Van Houten, C3P0, and the kids from *Weird Science.*

Betcha didn't know that C3P0's processor proudly declares MMX support!

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GEEKQUIZ

TIER 2 GEEKDOM

19 to 36 correct answers

It's possible to be nerdy, maladjusted, and generally inept, yet still claw your way up to Tier 2 Geekdom on the merits of a single, specialized talent.

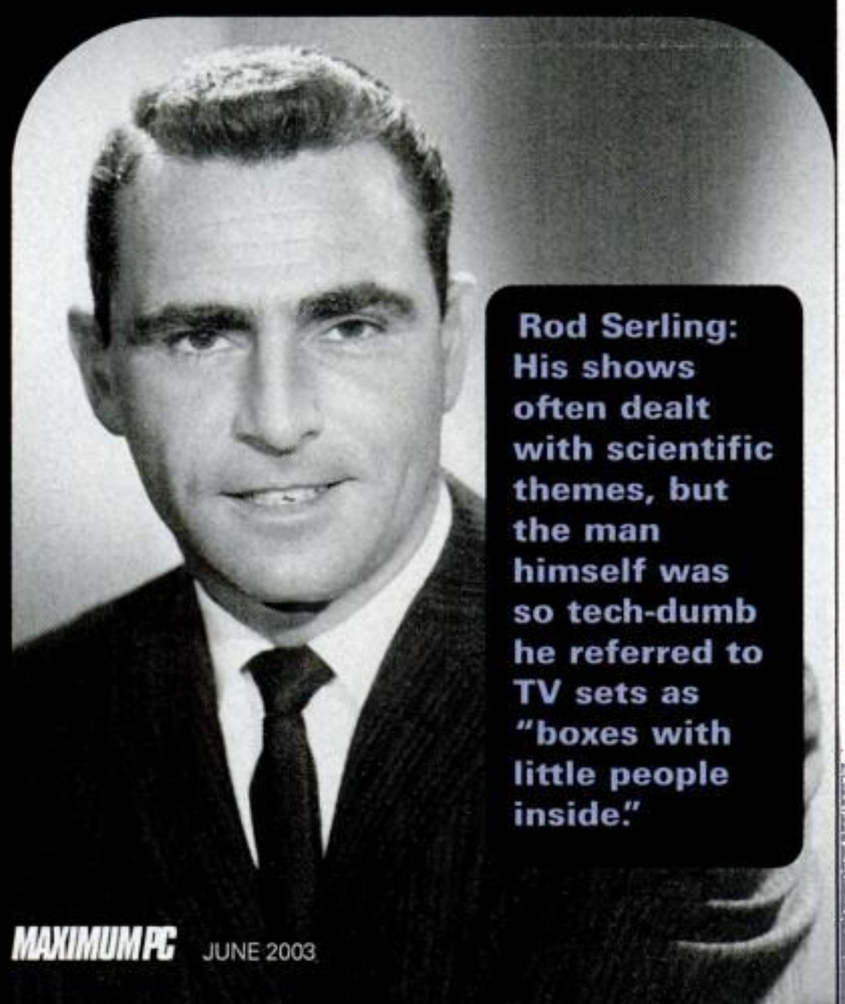
Got an eerie, idiot-savant knack for converting kilobits into megabytes? Can you enter, alter, and save a new BIOS config in less than 12 seconds, blindfolded? Do you know the names of every Intel chipset ever created, and are able to list them in alphabetical order? Congratulations, you're a Tier 2 Geek—despite the fact that you believe AMD processors can run on Intel motherboards, that you've never once correctly set your BIOS, and that you think kilobits and megabytes are units of foreign currency.

Take the Professor. He was an ostensibly smart fellow. His head was full of equations, theorems, and problem-solving tips and tricks. Yet he got on a rickety little boat right before the storm of the century, and once he was shipwrecked, he never imprisoned Gilligan in a bamboo cage on the other side of the island to make sure the dope-smoking beatnik wouldn't ruin yet another rescue attempt.

That's a Tier 2 Geek for you. Not quite the whole package.

The Tier 2 Fraternal Order of Inadequacy—Not a Hell of a Lot of Talent Under Close Inspection: Dr. Smith, Sgt. Andrew Carter (or any other role played by Larry Hovis), Dr. Bunsen and Beaker, Rod Serling, and the guys who thought they discovered cold fusion.

Right before the Jupiter 2 was pulled into a black hole, Dr. Smith confessed his love to Robot.



Rod Serling: His shows often dealt with scientific themes, but the man himself was so tech-dumb he referred to TV sets as "boxes with little people inside."

20 The DVD Forum's MultiPlay specification rather pointedly omits which DVD format?
- **A** DVD-R/W
- **B** DVD-RAM
- **C** DVD-ROM
- **D** DVD+R/W

21 The maximum throughput of the USB 2.0 specification is:
- **A** 50MB/sec
- **B** 60MB/sec
- **C** 72MB/sec
- **D** 112MB/sec

22 Chinese kung-fu movies are also known as wuxia films. What is Windows Media Player 9 series also known as?
- **A** Longhorn
- **B** Cervantes
- **C** mCodec
- **D** Corona

23 Which videocard manufacturer disturbed millions with an advertisement featuring a spooky, curly-haired, androgynous model?
- **A** ATI
- **B** nVidia
- **C** Matrox
- **D** Trident

24 Which Pentium 4 frontside bus speed is Intel *not* using?
- **A** 400MHz
- **B** 533MHz
- **C** 667MHz
- **D** 800MHz

25 Which is not an official ICANN domain name?
- **A** .tv
- **B** .usa
- **C** .cc
- **D** .name

26 Which CPU did Intel most recently announce?
- **A** Pentium 4B
- **B** Pentium III ULV
- **C** Itanium
- **D** Pentium M

27 What was a limitation of the Serial ATA motherboards released last year?
- **A** Serial ATA connectors just plugged into the PCI bus, which limits transfers to 133MB/s and adds latency
- **B** Original Serial ATA controllers are incompatible with newer firmware on production SATA drives
- **C** None of them worked
- **D** Leaky capacitors made them prone to industry-wide product recalls

28 What is the difference between an AMD Barton CPU and AMD Thoroughbred CPU?
- **A** L2 cache increased to 512KB
- **B** Substrate changed from brown to green
- **C** New smaller 0.13-micron process technology
- **D** An added layer that helps the Barton scale to higher speeds

29 SiS stands for:
- **A** Silicon International Systems
- **B** Silica Initiated Stream
- **C** Sionic Interference Suppression
- **D** Silicon Integrated Systems

30 AMD has used code-names that represent:
- **A** Planes, tools, ships
- **B** Beer, cities, soda
- **C** Cars, tools, horses
- **D** States, WWII aircraft carriers, presidents

31 AGP 8x runs on how much voltage?
- **A** 0.8 volts
- **B** 3.3 volts
- **C** 5 volts
- **D** 12 volts

32 EPS-12V is:
- **A** An EPS conduit that routes power through the main plasma manifold in your power supply
- **B** A new workstation power supply spec
- **C** A proprietary Enhanced PostScript standard created by Adobe
- **D** The new standard for routing 12-volt power rails in the next-generation ATX spec

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33 **How many Serial ATA drives can you run on each individual channel?**

A One
B Two
C Three
D Four

34 **Which VIA chipset is *not* intended for an Intel CPU?**

A Apollo Pro 133A
B Apollo Pro 266T
C PLE133
D Apollo ProSavage KN400

35 **What's another name for the phenomenon known as a "parhelia?"**

A Libations
B Moon kitty
C Sun dog
D Librations

36 **DirectX 10 is expected to:**

A Provide a high-level programming language for pixel shaders
B Ship with the next release of Windows (code-named Longhorn)
C Enable PCs to connect to Xbox Live servers
D Both A and C

37 **"Tag and Seek" is IBM's proprietary name for:**

A Command queuing
B Data buffering
C Positioning the most accessed files at the outer rings of each platter
D Striping the most accessed files across the outer rings of each platter

38 **How far does Intel expect to scale the NetBurst architecture?**

A 1THz
B 400GB/s
C 5GHz
D 10GHz

39 **What city has Intel named a motherboard after?**

A Oakland
B New Orleans
C Eureka
D Easton

40 **Which CPU features an integrated heat spreader?**

A Coppermine Pentium III
B Tualatin Pentium III
C Thoroughbred B Athlon XP
D Deschutes Pentium II

41 **In Windows XP, Shift-F10 is the equivalent of:**

A A double-click
B The Send To command
C Fast log off/change user
D A right mouse-click

Two-point question!

42 **If you add a model 3000+ Athlon XP to a model 1900+ Athlon XP and subtract two model 2000+ Athlon MPs, how many megahertz do you have left?**

A 433
B 633
C 566
D 0

43 **What version of the LithTech engine powered Cate Archer's cutting-edge fashions in *No One Lives Forever 2?***

A Triton
B Uranus
C Gucci
D Jupiter

44 ***Iometer* is most likely to be used to test which of the following types of components?**

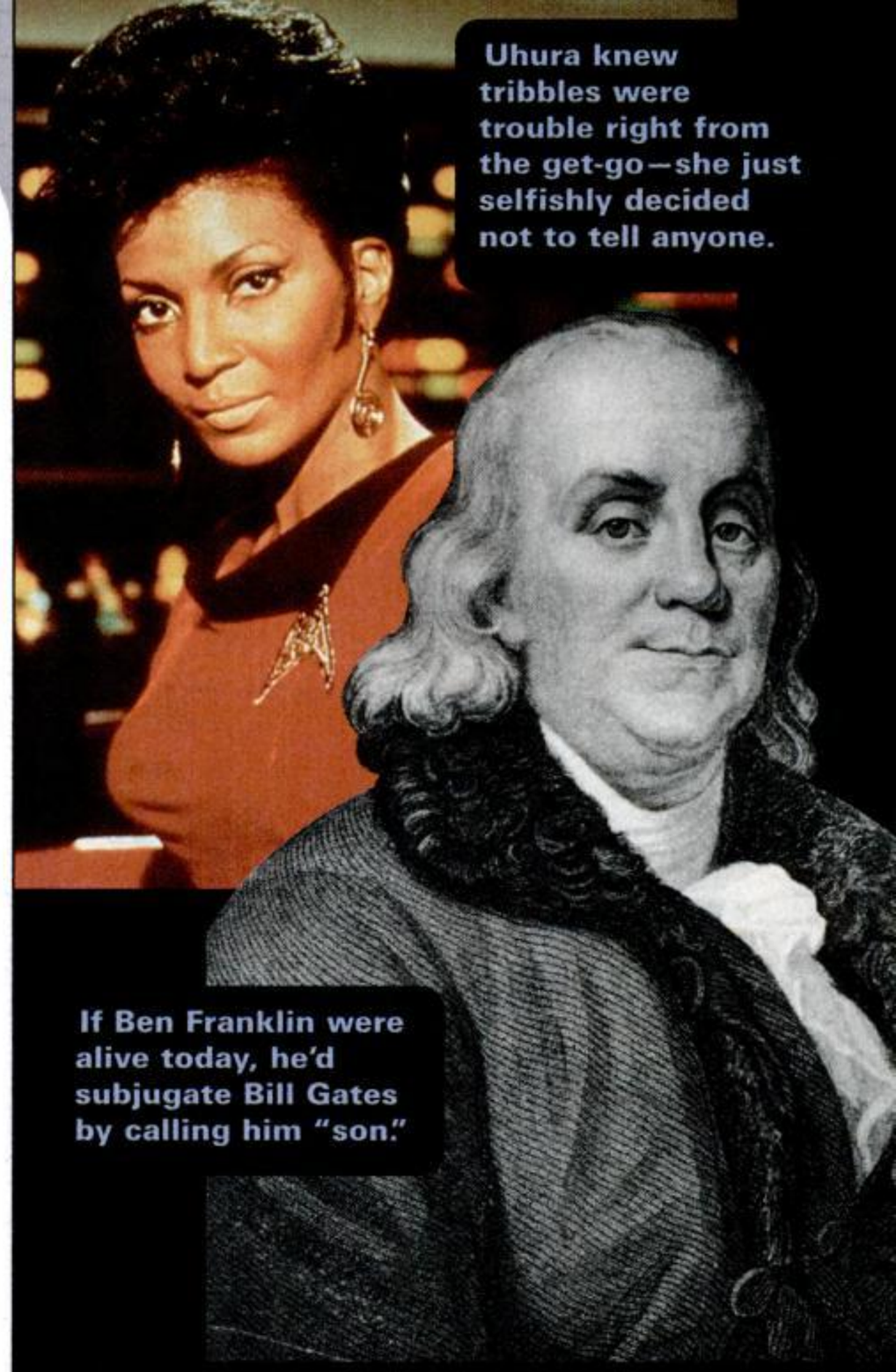
A Flash memory
B 3D accelerators
C Hard drives
D Ethernet cards

45 **What does a Torx screw head resemble?**

A A caret
B A tilde
C An asterisk
D A plus sign

46 **How do LCDs scale non-native resolutions?**

A Through interpolation
B Through interlacing
C Through interpretation
D Through diffusion



Uhura knew tribbles were trouble right from the get-go—she just selfishly decided not to tell anyone.

If Ben Franklin were alive today, he'd subjugate Bill Gates by calling him "son."

TIER 3 GEEKDOM

37 to 54 correct answers

This is where geeks turn the corner. Tier 2 Geeks know just enough about computers to destroy them, but Tier 3 Geeks know so much about computers, they come close to destroying themselves.

Your best friend might be a Tier 3 Geek. He might seem like a healthy, well-adjusted individual. But then you don't hear from him for a few weeks, so you drop by his pad to see if there's been any foul play. The door is open, so you walk in, and there he is, crouched over his PC's innards, bathed in the light of a 60W bulb dangling from the ceiling. The room is littered with Gatorade bottles and Vienna sausage containers, and just as you begin to wonder how the lurid scene might be deconstructed by the "CSI" squad, your friend asks you to hand him a spare drive rail, as if you and he had spent the last two weeks together.

Yes, in between the sad ignorance of the Tier 1 Geeks and the creepy brilliance of Tier 4 Geeks, Tier 3 Geeks carve out an honest little niche. They're somewhat socially inept, and they're not good at everything, but they are unequivocally brilliant when it comes to computers, science, and technology.

The Tier 3 Hall of Historical Smarty-Pantses—They're Not Interdisciplinary Geniuses, But They've Mastered Their Chosen Subjects: Mr. Peabody, Lieutenant Uhura, Agent Scully, Ben Franklin, and the kid who hacked computers in *War Games*

Answers: 20-d, 21-b, 22-d, 23-a, 24-c, 25-b, 26-d, 27-a, 28-a, 29-d, 30-c, 31-a, 32-b, 33-a, 34-d, 35-c, 36-b, 37-a, 38-d, 39-d, 40-b, 41-d, 42-a, 43-d, 44-c, 45-c, 46-a

ROD SERLING, DR. SMITH, AND BEN FRANKLIN PROVIDED BY HOLTON/ARCHIVE BYGETTY IMAGES; UHURA PROVIDED BY GETTY IMAGES

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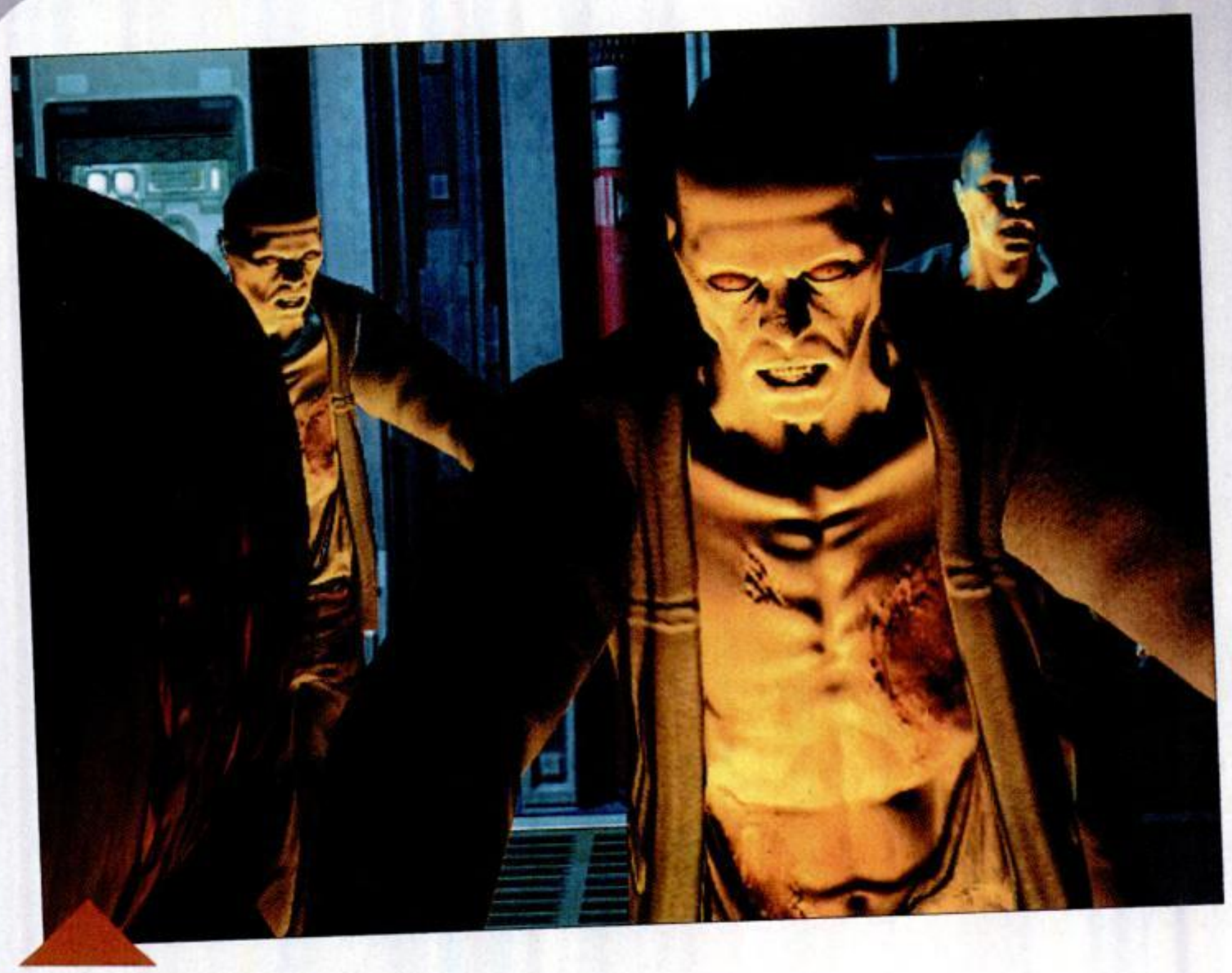
GEEKQUIZ



47 **What game is this image from?**

A *Deus Ex: The Invisible War*
B *Rayman 3: Hoodlum Havoc*
C *Grand Theft Auto: Toxic City*
D *Doom III*

48 **Arrange the following discs in the order of capacity, from smallest to largest:**

A DVD-9
B Sony's Double Density CDR
C Blu-ray
D DVD-R

49 **Where would you most likely install a fanbus?**

A Rear I/O panel
B Front bezel
C Beside your 3D card
D Over your CPU

50 **"Wobble" grooves are used in recordable DVD media for what purpose?**

A To generate "clock" data for the drive
B Grooves with a slight wobble are less prone to read errors
C Grooves with a slight wobble are less prone to write errors
D More surface area on the disc can be used for writing

51 **Which one is *not* a flash memory format?**

A xD
B SD
C MagicGate
D StorCard

52 **Which of these is *not* a player class in *Battlefield 1942?***

A Scout
B Engineer
C Sniper
D Medic

53 **Which of these games is an RPG?**

A *Dungeon Siege*
B *Battlefield 1942*
C *Command and Conquer: Generals*
D *Chemicus*

54 **Where is *Maximum PC* HQ located? (No peeking!)**

A Santa Clara, CA
B Brisbane, CA
C San Francisco, CA
D New York, NY

55 **How many bits are in one byte?**

A 8
B 2
C 16
D 4

56 **If an alien species has eight digits on each hand, which numerical system would they be most likely to use?**

A Decimal
B Octal
C Hexadecimal
D Binary

57 **Which of these batteries is most likely to be found in today's laptops?**

A Manganese dioxide
B Nickel-cadmium
C Lithium-ion
D Nickel ion-sulfide

58 **What is the number stamped on Athlon XP CPUs called?**

A Serial emblem
B Batch identifier
C There's no fancy name for it—it's just a serial number, for heaven's sake
D Ordering part number

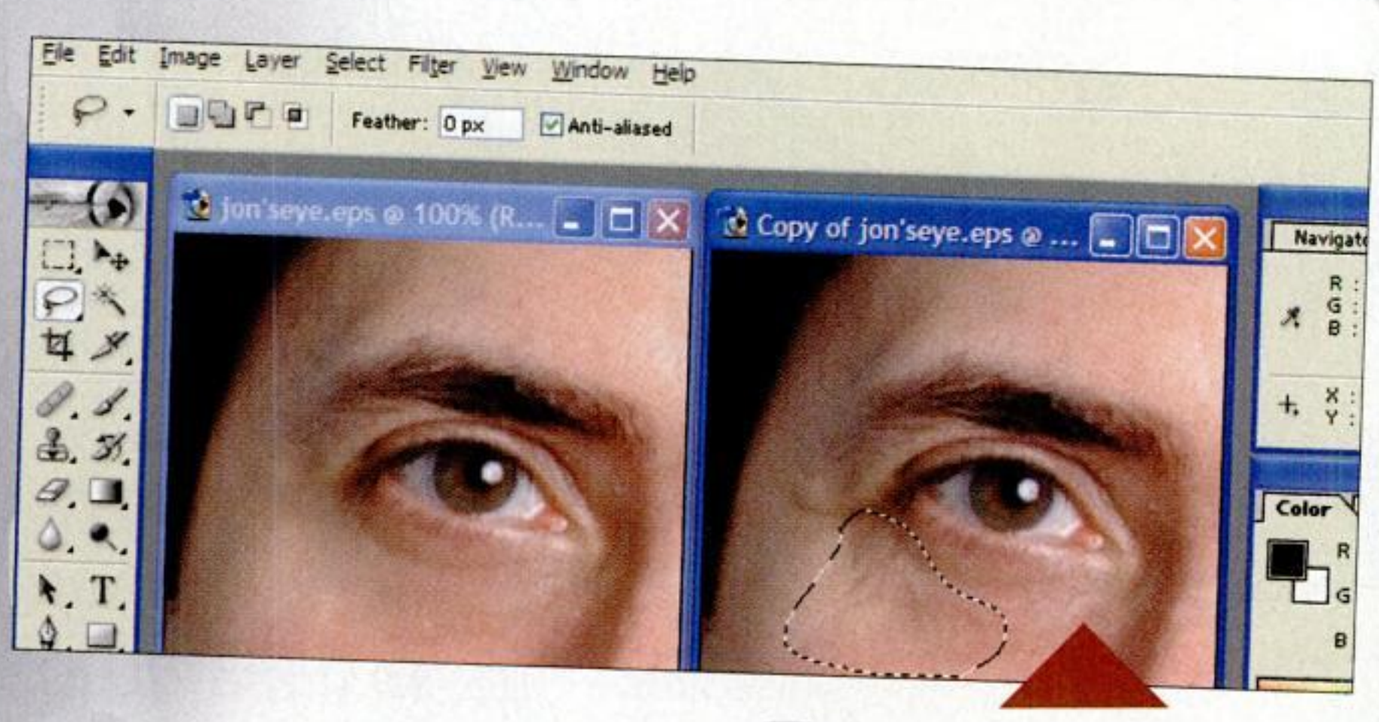
59 **Which of these specs describes Intel's upcoming "Prescott" chip?**

A .09 micron process, 800MHz bus
B .13 micron process, 800MHz bus
C .09 micron process, 533MHz bus
D .13 micron process, 333MHz bus

Two-point question!

60 **Match the processor with its manufacturer:**

A Crusoe	**1** Texas Instruments
B DragonBall	**2** Intel
C OMAP	**3** Motorola
D XScale	**4** Transmeta



61 **Why would you want heating in a phase-change cooling system?**

A To stabilize rapid temperature swings when the PC is turned on or off
B To prevent condensation from forming
C To prevent deterioration and cracking of the rubber gaskets around the cooling heads
D Because there's no way to reliably prevent the cooling head from becoming too cold

62 **Arrange the following from the slowest transfer rate to the fastest:**

A USB 2.0
B FireWire b
C 802.11b
D 802.11a

63 **What videogame did Bill Gates author?**

A *Monopoly Tycoon*
B *Donkey*
C *Zork*
D *Myst*

64 **Which one of these programs is not a 3D rendering app?**

A *Lightwave*
B *Caligula*
C *Maya*
D *Caligari*

65 **Which of the following is an ATI fanboy site?**

A atifanboysite.com
B allinwonders.com
C outrage.com
D rage3D.com

66 **Which *Photoshop 7* tool brought the youth back to these eyes?**

A Healing tool
B Acid tool
C Anti-wrinkle tool
D Clone tool

67 **What's Tom's (of Toms Hardware.com) last name?**

A Coors
B Miller
C Pabst
D Schlitz

68 **Where's John Romero working these days?**

A id Software
B Epic
C Clepsydra
D Monkeystone

69 **Who used the Digital Millennium Copyright Act to stop a third-party ink manufacturer from being able to sell cheaper cartridges?**

A Dell
B Lexmark
C Epson
D Hewlett-Packard

70 **What's the e-mail address of the *Maximum PC* nurse?**

A rachel@maximumpc.com
B rachelg@maximumpc.com
C nurse@maximumpc.com
D For the love of Pete, let the joke die a peaceful death! ■

DR. STEPHEN HAWKING PROVIDED BY GETTY IMAGES; MADAME CURIE PROVIDED BY HULTON/ARCHIVE BY GETTY IMAGES

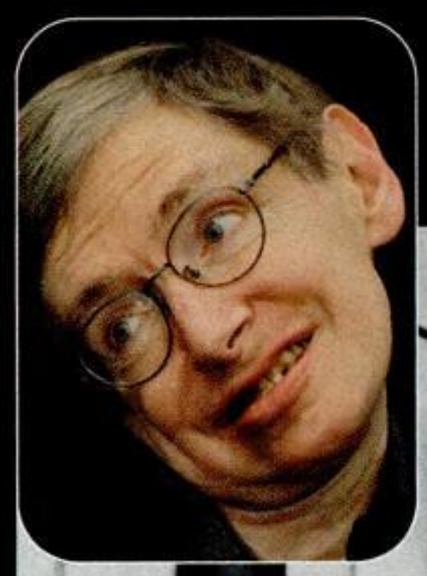
TIER 4 GEEKDOM

55 to 72 Correct Answers

You know that "scary territory" that Tier 1 Geeks often wander into? Well, Tier 4 Geeks are not only well within those borders, they've also got a permanent residence, a passport, and have all their magazines mailed there.

The Tier 4s are history's übergeeks, the people who scribble down a few diagrams on a cocktail napkin at the beginning of the week, and have a working prototype for holographic storage by Friday. There are many Tier 4 Geeks who languish in obscurity, having never dramatically changed the world, and it takes another Tier 4 Geek to even appreciate their kooky ideas and spasms of genius. Tier 4 Geeks often appear to be Tier 1 Geeks at first glance: They're awkward, weird, and freaky—but only because they're too preoccupied with their tech pursuits to spend much time fixing their hair.

The Tier 4 Legion of Unmitigated Genius—They May Not Be Sharp Dressers, But You Can't Deny These Folks Are Smart: Stephen Hawking, Buckminster Fuller, Leonardo Da Vinci, Marie Curie, Albert Einstein



The young Stephen Hawking dabbled in the occult.

No, Marie, that isn't a decanter of fine balsamic vinegar you're holding. It's actually a key scientific breakthrough.

Answers: 47-d, 48-bdac, 49-b, 50-a, 51-d, 52-c, 53-a, 54-b, 55-a, 56-c, 57-c, 58-d, 59-a, 60-a:4, b:3, c:1, d:2, 61-b, 62-cdab, 63-b, 64-b, 65-d, 66-a, 67-c, 68-d, 69-b, 70-d

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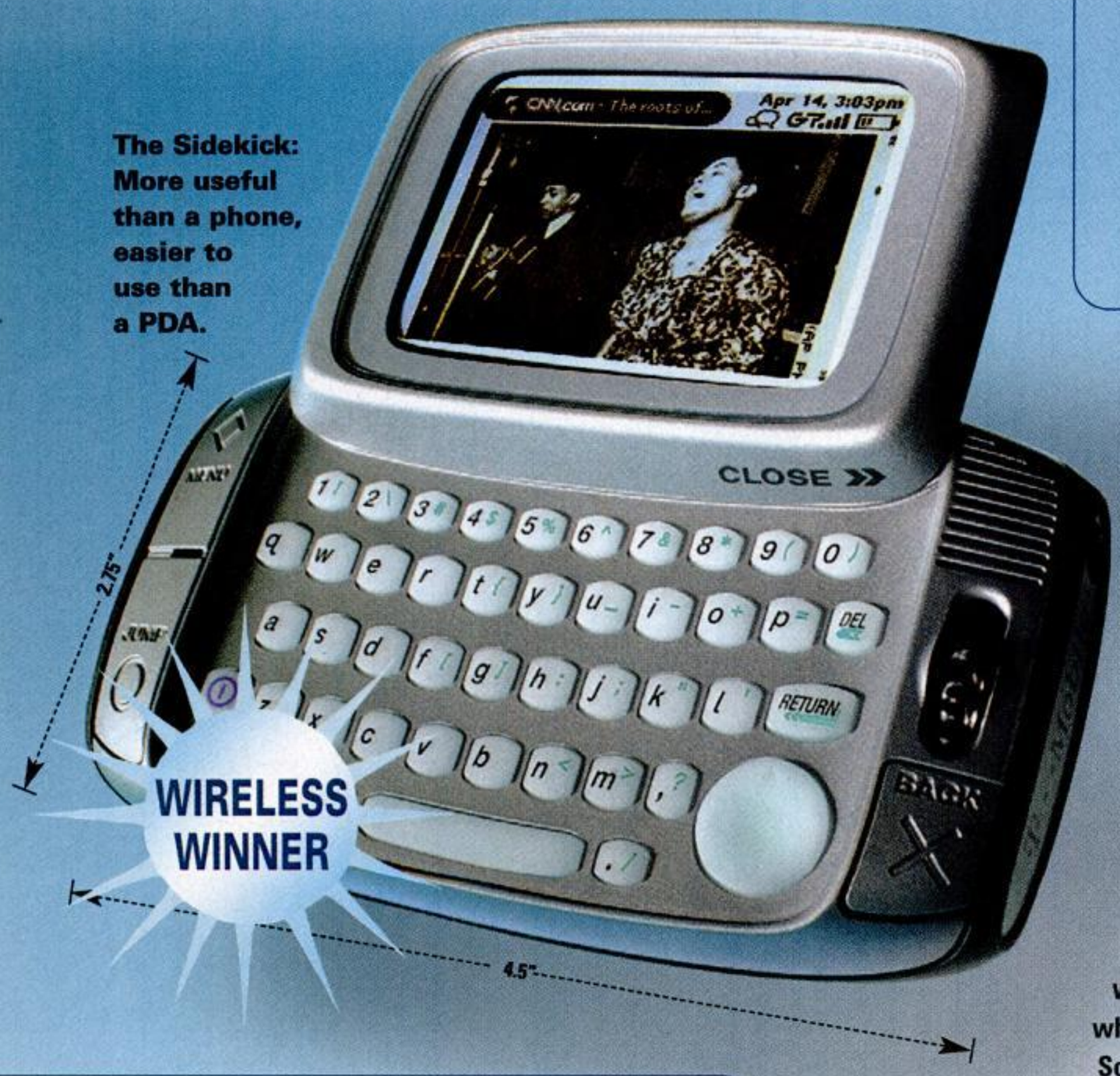
CNN 24/7

We field-test five mobile devices that'll keep you swimming in headlines. Which one is utterly indispensable?



The Sidekick: More useful than a phone, easier to use than a PDA.

If you take away our cell phones, we'll hate you, but we'll adapt. Hey, we might even start sending postcards again. But don't you dare touch our Internet connection. Without that, we're dead. Like oxygen and potato chips, the net has become an integral part of life itself—without it, we're *nothing*. But no one wants to be tethered to a desktop machine all the time, so it's only natural that we find devices that'll satisfy our Internet addiction while on the go. And we're not just talking about getting our e-mail while stuck in traffic. No, we want it all: Instant messaging, web surfing, and, of course, continuous news feeds.

Here's our basic take on modern portables: If a device can tap into CNN.com headlines every minute of every day, then it'll be capable of delivering just about anything else we could need from the mobile Internet. We can live without high-bandwidth streaming video until we get back to home base, but we do want to know what's going on in Mosul—or PacBell Park—from wherever we are, whenever we want.

So if it's the wireless web you want, read on to find out which portable kept us most in touch while weighing us down the least.

—BY LOGAN DECKER

THE HANDHELD

T-Mobile Sidekick

Oh, how we laughed when the T-Mobile Sidekick rolled into the office. We teased it mercilessly for its cuteness, dangled it over the toilet, and took its lunch money. But now we're calling it the "Sidekick-Ass," because that's what it does. It's become a companion and a friend, and we still get a thrill when we see the screen swivel away at the touch of a finger to reveal a small, backlit keyboard (in the standard QWERTY arrangement, no less).

The Sidekick packs a world of web goodness in a device that's roughly the size of a tamale. You don't even have to type in "www" or ".com" to call up a URL; just the site name, like "yahoo" or "maximumpc," is sufficient. When the tiny web cobbler at Sidekick gets your site request, he does a fancy little number on the web pages, reducing images to fit the screen, and lining up links and text so you can scroll through them easily. It's a wildly successful and efficient maneuver.

In our experience, pages seemed to load at just slightly slower than 56kbps dial-up speeds, but you can scroll while the page loads, so it's not as tedious as it might sound. As you scroll downward, the Sidekick jumps to each hyperlink, and a single press of the scroll wheel will take you to wherever it points. The device's image resizing abilities were marvelous. Take TheOnion.com for example: Even the satire site's weekly infographic was legible once reduced to fit the Sidekick screen. You can also elect to trim out images altogether if you want to speed up your browsing.

Of course, the Sidekick is more than just a mobile browser. It's also a handy cell phone that works well, despite the awk-

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wardness of its decidedly un-phone-like formfactor. AOL's Instant Messenger client is built into the Sidekick, as is a POP3 mail client, and the usual roundup of PDA tricks (calendar, notepad, to-do list). You can slap on a camera attachment, but at 120x90, the resulting images are more like "icons" than "photographs."

The Sidekick's navigation scheme is a breathtaking triumph of common sense (we never even cracked open the manual). The thumbwheel scrolls to select menu items and hyperlinks. The "jump" button hustles you to and from the various Sidekick functions. The "menu" button drops down menu options for each function, and the "back" button does an about-face if you change your mind after clicking on a link. There's also a four-way directional pad next to the keyboard for games and whatnot.

We do have a beef with the omission of a memory expansion slot to complement the Sidekick's built-in 16MB RAM. And better power management might have extended the rather scant three hours of talk time the device offers as a cell phone. Still, the Sidekick earned not only our respect, but also our affection.

Pluses: Replaces your phone and PDA. Generous web display and tasty interface.

Minuses: The upcoming color version will be even cooler. It's a bit on the bulky side.

Pricing
- $250, though rebate offers are easy to come by
- $40–60 monthly access fee, depending on your plan

www.tmobile.com

Connection
- GPRS, up to 40.2kbps (data)
- GSM, up to 43.2kbps (voice)

THE SMART PHONE

Nokia 3650

You want convergence? Converge *this*. Nokia's 3650 combines a cellular phone with a web browser, a bunch of PDA functions, a 640x480 digital camera, and even a mini video-camera—all in a single device that's just a wee bit larger than the average cell phone.

Admittedly, the "video camera" is more like a digital ViewMaster, but we'll let that slide. It's the news we're after, and the Nokia 3650 delivers. In fact, under the "News & Sports" hyperlink that's embedded just a single click away from the main screen, CNN was at the top of a pre-configured list of news and entertainment portals. These portals are essentially pre-digested web pages that have been formatted for small-screen mobile devices, and also include ABC News, ESPN, and the ever-useful MapQuest.

The 3650's screen can display nine lines of 30 characters. Headlines longer than 30 characters run off the right edge of the screen, but you can scroll the directional pad to see them in full. As you can see from our photo, the D-pad forced Nokia to arrange its touch-dial numbers in a rotary style. But why the numbers don't follow the standard rotary config is beyond us.

Doing the "wireless web thing" isn't pretty on the 3650. Images are stripped out of pages, so you're left with a haphazard collection of links that scroll painfully slow. The depth of Nokia's pre-formatted information portals are more than adequate for mobile surfing, but the portal pages load in fairly small bites. You get slightly less than two screenfuls of text before having to load the next page with the D-pad. It's too bad the phone doesn't pre-cache the next page of a continuing article. If it did, the time it takes to go through an article would easily be halved.

The Nokia 3650 didn't disappoint us out in "the field," if that's what you want to call San Francisco from the beach on the west end to downtown on the east side. We never lost our info connection. But the 3650 is still purely utilitarian. You'll love it for getting vital information like the latest headlines, weather forecasts, and movie times, but not for recreational surfing while you're waiting in a line.

Pluses: Color display, spy camera, video capture.

Minuses: Vexing round dial, and it's still a cell phone with a cell phone–size screen.

Pricing
- $500 without a calling plan
- $300 with a plan, plus bagfuls of rebate offers that vary by locale

www.nokia.com

Connection Options
- Tri-band GSM, up to 43.2kbps (voice)
- GPRS, up to 40.2kbps (data)
- Bluetooth

You can change the faceplate of the Nokia 3650, but you're stuck with the bizarre rotary dial.

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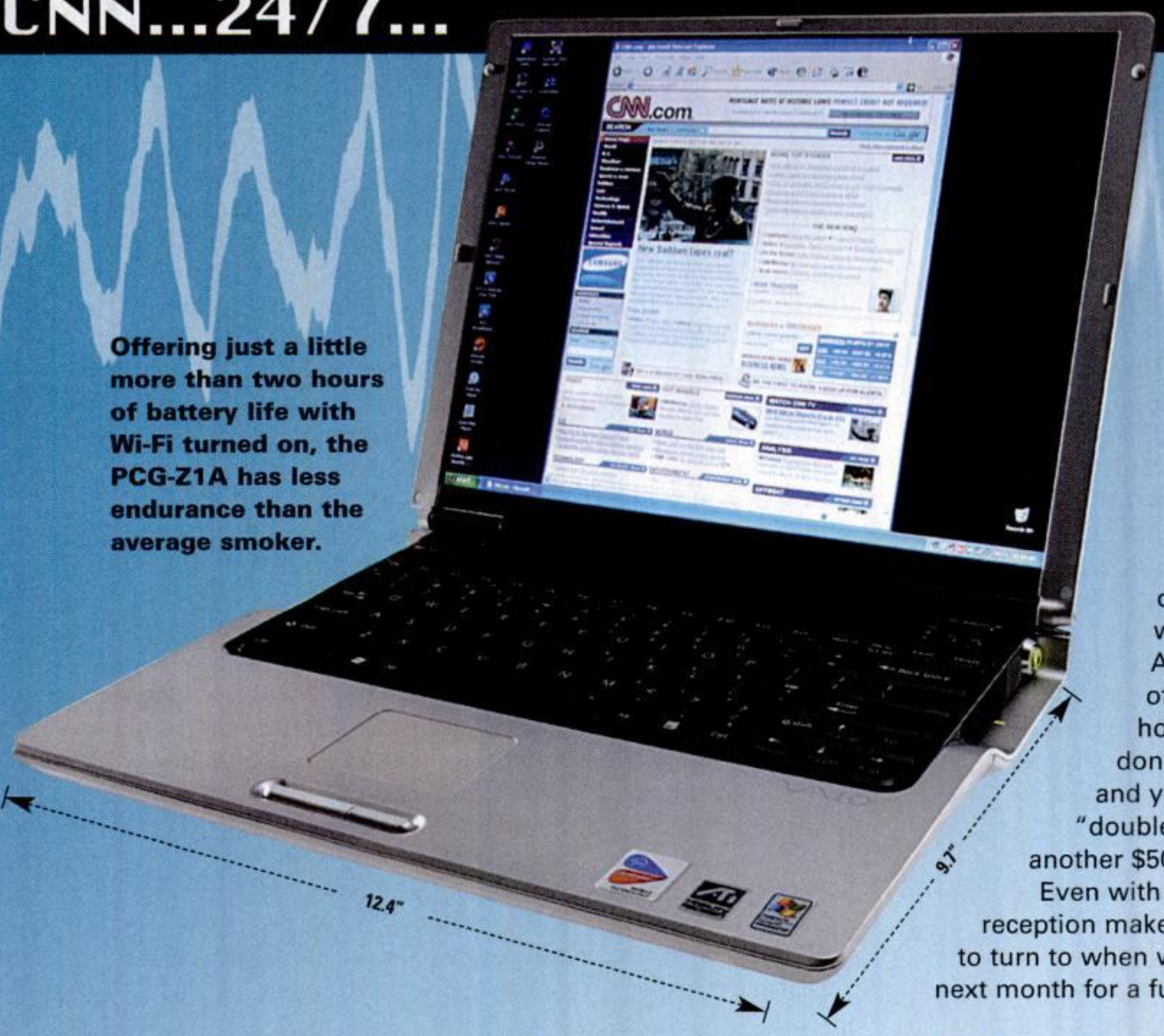
CNN...24/7...



Offering just a little more than two hours of battery life with Wi-Fi turned on, the PCG-Z1A has less endurance than the average smoker.

OK, it's a thing of beauty and a pleasure to use. Great. But as a wireless receiver, this Vaio bites. We can understand a struggle with our secret Wi-Fi hotspot downtown, but even in the office and at home, the Z1A consistently had trouble keeping connected. This meant frequent reconnections through the Wireless Network Connection applet, and page reload after page reload following these interruptions. We also have a grievance with the built-in speakers. Nobody expects laptop speakers to bruise internal organs, but even those stupid singing fish wall ornaments have more bass than this. And we only got a little more than two hours of use with Wi-Fi turned on. There is a switch, however, that turns off the receiver when you don't need it, thus extending battery life a bit, and you do have the option to swap in Sony's "double-capacity" battery, but that'll set you back another $500.

Even with the extended battery life, the wheezy Wi-Fi reception makes the PCG-Z1A the device we're least likely to turn to when we need to stay in touch with the net. Check next month for a full, formal review of the PCG-Z1A.

Pluses: The thrill of a luscious Sony laptop. The web in all its multi media overkill.

Minuses: As light as it is, it's still a laptop. Doesn't lock on to a Wi-Fi signal very well.

Price
➤ $2,400
www.sony.com

Connection
➤ Wi-Fi

THE THIN-AND-LIGHT NOTEBOOK

Sony Vaio PCG-Z1A

Yes, it's a laptop, and no, it's not as convenient as some of the other gadgets we've looked at. Especially not the portables, such as the Sidekick, bred specifically for cargo pants. But, oh, the beauty of it. Sony's creations typically range from the novel to the magnificent, and the Z1 series leans toward the latter. It's just a little more than four and a half pounds (less than your average lunchbox, including lunch) but includes a 14.1-inch diagonal screen. Other key hardware includes Intel's 1.3GHz Pentium M, 512MB of DDR SDRAM, a 60GB hard drive spinning at 4200rpm, and a combo DVD-ROM/CD-RW optical drive (24x CD-R max). Connection options include built-in Wi-Fi, built-in Ethernet, and an integrated V.90 modem for dire emergencies. Pushing the polygons is an ATI Mobility Radeon with 16MB DDR SDRAM.

The keyboard has a gentle, comfortable slant, and the inverted-T arrow configuration makes surfing and navigation a breeze. All the function keys are present, but Page Up, Page Down, End, and Home require holding down an additional key. Despite a spartan and tastefully restrained appearance, Sony still found a place for two programmable buttons that can be configured to launch apps, switch Wi-Fi networks, or do anything else you can think of.

THE PDA

HP iPaq 5450

When you look at the black and white, relatively modest screen of the Sidekick on page 44, you might be tempted to think of it as somewhat compromised compared with HP's iPaq. But despite the iPaq's vastly larger color screen, it's paradoxically *less* comfortable to surf the web than it is with the Sidekick.

Well, maybe it's not such a paradox. As we mentioned before, the Sidekick's back-end servers reformat pages for the Sidekick screen. The iPaq, on the other hand, doesn't do any reformatting on the back-end, the front-end, or any end. As a result, when you try to download content via the Wi-Fi

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network in your midst, you can see just a tiny portion of any web page at one time. Confused? Just set your PC's screen resolution to 320x240, and load a page. Yeah, it's just like that. Basic surfing becomes a chore. Checking headlines, finding movie reviews, mapping directions—iPaq's bundled *Internet Explorer* browser saps the fun out of everything.

But luckily, you're not stuck with *Internet Explorer*. You can also get content optimized for handhelds—not just the iPaq, but any handheld—using a service provided by AvantGo. Yes, it includes CNN, and it's even free! First go to the AvantGo web site at **www.avantgo.com**. Confirm that your device is supported, then select the "channels" you want from the database of—hang on—more than 2,500 titles. You can sign up for news services like CNN, Wired, and the New York Times, as well as hard-to-find gems such as the German language periodical "Womanager –Tipps für Businesswomen."

You can preview how each channel will look on your handheld, and then add it to your list with a single click. Each time you add a channel, you'll have an opportunity to create an account. After you've done so, AvantGo will refresh your handheld with all the updates from your channels every time you sync your PDA. Once you've synchronized, there's virtually no delay when you're surfing your downloaded content, because it's already in the device.

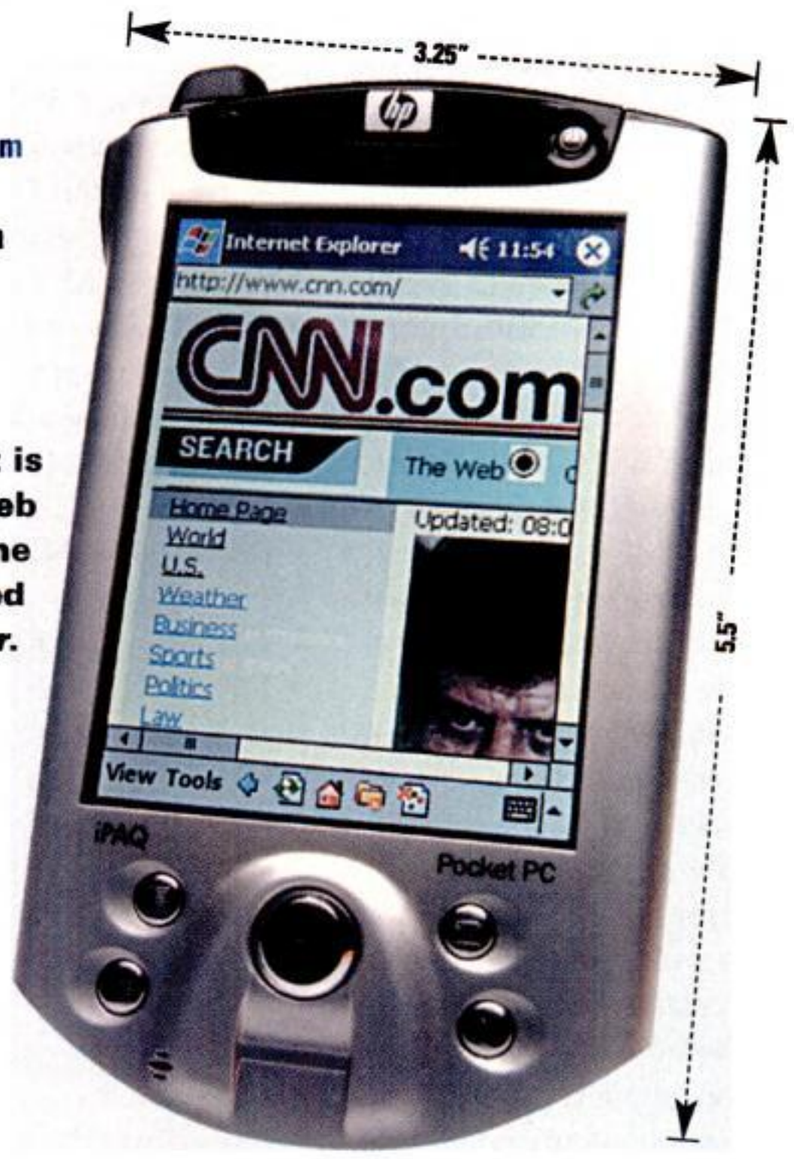
Of course, there's one big gotcha: You need to sync up whenever you want fresh content, and that defies the whole concept of 24/7 news. Seeing as how even frustrating web browsing via the embedded *IE* browser requires close proximity to a Wi-Fi hotspot, we're willing to declare, for the record, that the iPaq (reviewed on page 67) really isn't an ideal news source (though its Wi-Fi reception was far better than that of Sony's PCG-Z1A laptop!)

Pluses: A great PDA, and it beats the Sony laptop's Wi-Fi reception.

Minuses: A little big around the hips, if you know what we mean. Web pages aren't reformatted for the small screen.

Price
➤ $700
www.hp.com

Connection
➤ Wi-Fi

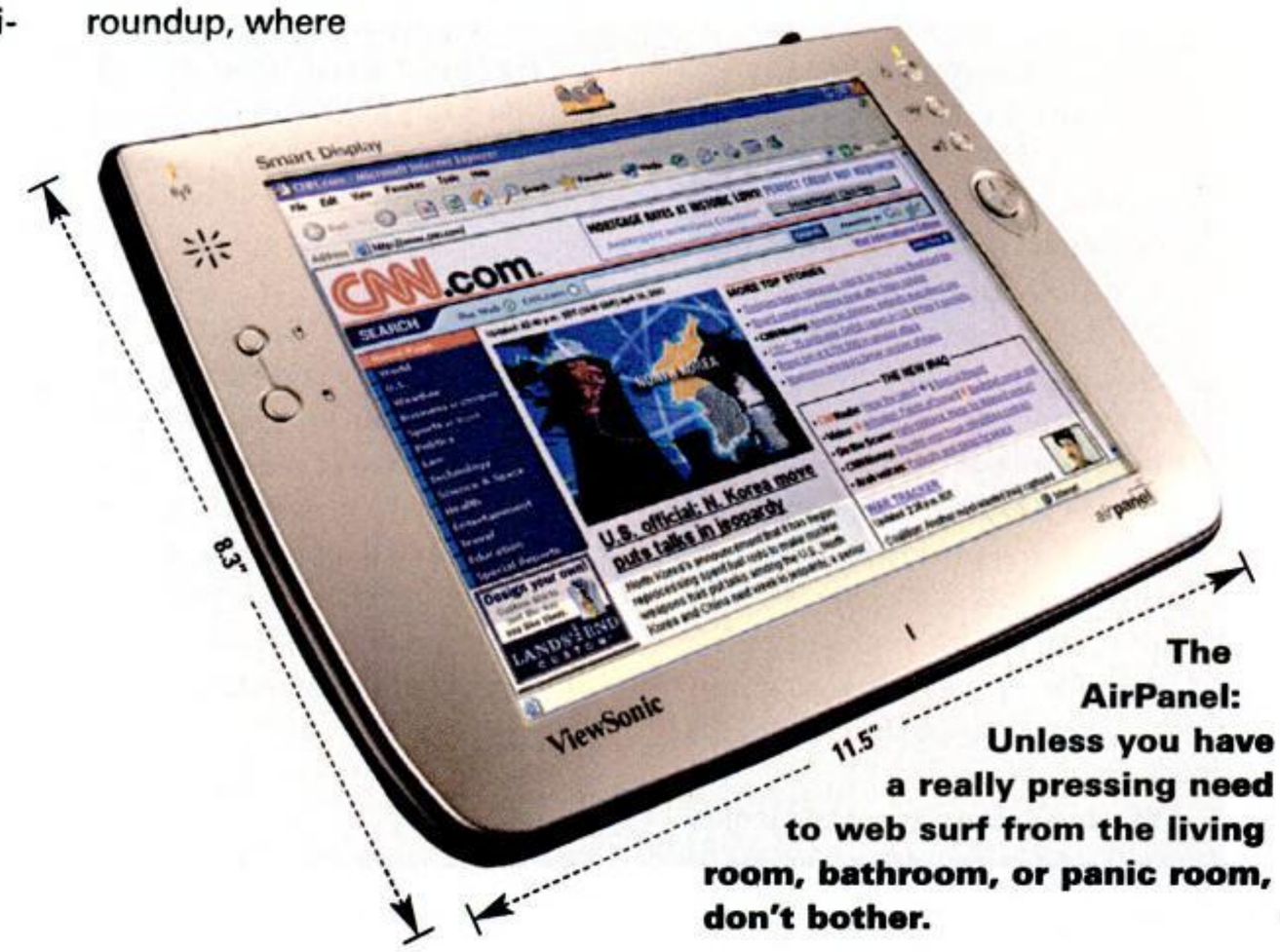


All you get is peek-a-boo web surfing with the iPaq's embedded *Internet Explorer*.

THE TABLET PC

ViewSonic AirPanel

It's not a fun contest unless there's one really big loser. Which brings us to the ViewSonic AirPanel, which received a 6 verdict in our March issue. Essentially a "dumb terminal" that receives its screen image over a wireless connection, the device requires not only a Wi-Fi hotspot, but also a host PC, to feed it content. So while it's fine for web surfing on your couch or backyard hammock, you can't use it away from home. This makes it a hugely expensive and not terribly useful bauble in this particular roundup, where



The AirPanel: Unless you have a really pressing need to web surf from the living room, bathroom, or panic room, don't bother.

go-anywhere, 24/7 news downloading is the name of the game.

That said, the AirPanel does let you surf at 800x600, which is more resolution than you'll get from any other portable device other than a laptop. The AirPanel's Wi-Fi reception is excellent, but you'd expect as much from a portable that requires a host PC for life support.

As ViewSonic reminds us, the AirPanel is akin to a cordless phone, and cordless phones (as opposed to mobile phones) do have their household uses. It's a somewhat apt comparison, but cordless phones perform exactly the same functions as corded phones, while the AirPanel can't match the capabilities of a full PC or notebook. It doesn't boast a high-res screen, it doesn't have the bandwidth to watch a movie, and it doesn't offer good sound quality. Yes, it's nice to read a few headlines before nodding off to sleep, but for $1000, why not hire a butler to read them to you?

Pluses: Shows the world that you can afford expensive toys.

Minuses: Most people can't afford it.

Price
➤ $1,000
www.viewsonic.com

Connection
➤ Wi-Fi

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Ask the Doctor

Symptom ▶ Diagnosis ▶ Cure

DUAL BOOT, THE SEQUEL

I dual boot with WinME for gaming on my C: drive and run WinXP Pro on my D: drive for all my apps and e-mail. I do this because when I'm gaming I have nothing running in the background, such as an antivirus scanner. I chose WinME because of my son's DOS games. Now we're pretty much through with the DOS games, and I want to run the games on WinXP. Here is my question: Do I dual boot with XP in both partitions the same way I have it set now, or is there a way to set up WinXP with another profile that I can switch to for games without having the antivirus running in the background along with all the other crap that we don't want on our gaming machine?

—STEVE ASHKENAZY

You *could* set up a separate profile without any apps preloaded, but it's much easier and more efficient to get a single reliable and speedy profile working than to set up separate partitions for gaming and work. If you've got more than an antivirus app, an IM client, and a personal firewall running, you should consider trimming your app load. The Doctor recommends disabling any system tray apps that you don't use at least twice a day. This means unused IM clients, *MusicMatch* and *WinAmp* tray icons, web cam applets, PDA synchronization apps, etc.

To remove the apps, press the Windows key and R to open the Run dialog. Then type `msconfig` and press Enter. Go to the Startup tab, and unselect any apps that are hogging your resources.

Now you can set up two accounts in the Users Control Panel. Use one for gaming, and the other for work to keep everything nice and tidy. Furthermore, it's possible to disable antivirus protection while you game. Just right click your software's tray icon and select the disable option. *Norton Antivirus* memory usage was cut in half when we did that, and this should minimize its impact on gaming.

> **IT WON'T DO ANY HARM TO YOUR MACHINE, SO YOU CAN'T LOSE BY TRYING.**

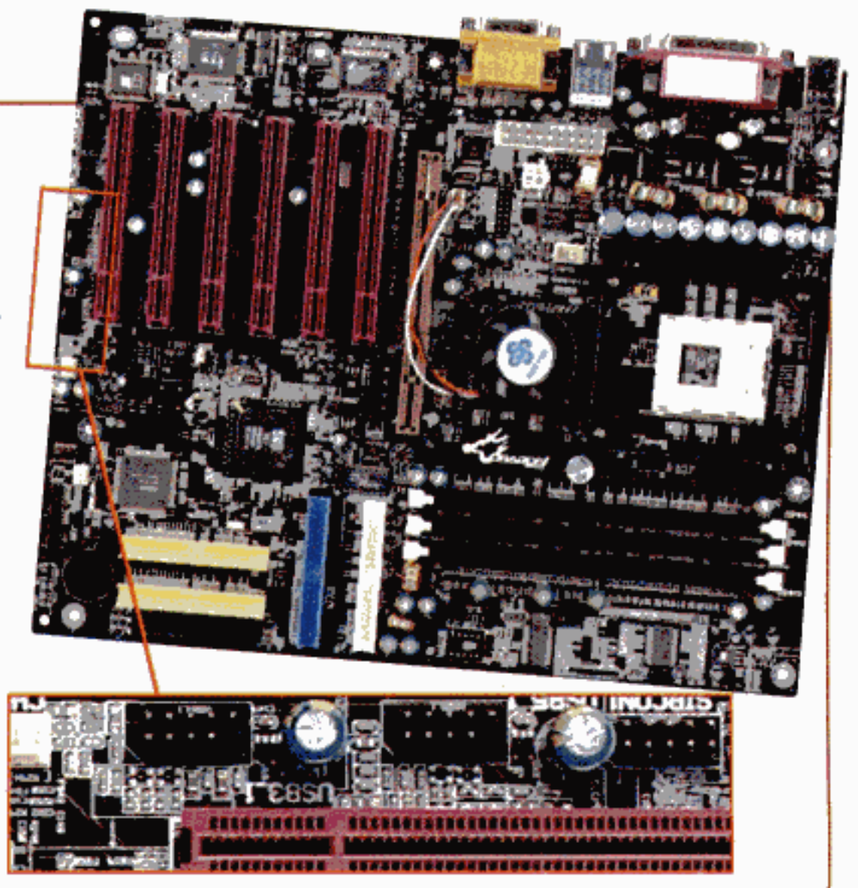
PONDERING FRONT-MOUNTED PORTS

I just ordered a new nForce2 motherboard and wanted to know if I can connect my case's front-mounted USB 1.1 ports to the 2.0 pin headers on the motherboard.

—CLIFFORD MUDD

We dug around the Lab looking for USB 1.1 front-mounted ports that could connect to one of the USB 2.0 mobos we have, but we came up empty-handed. However, we're pretty certain that it will work, as long as the connector is physically compatible. Whether it works or not, it won't do any harm to your machine, so you can't lose by trying.

If you're not into mixing and matching unsupported hardware configs, just go to the store and pick up a new USB 2.0 front USB header. They're usually less than $20.



Most motherboards are shipping with this connector that will allow you to mount a pair of USB 2.0 ports on the front panel of your PC—you just need the right adapter.

ATHLON AMBIGUITY

I'm the proud owner of an AMD Athlon XP–based rig. I got a really great deal on a mobo and processor, so I jumped on it. At the time, I didn't know the difference between the hotter Palomino core and the cooler Thoroughbred. Needless to say, my chip is a Palomino that runs at about 112° F. I have four case fans and a Thermaltake Volcano9 heatsink. Is there any performance difference between the Palomino and the Thoroughbred besides the temperatures of the cores? I'm a little concerned because whenever I see ads for AMD chips, I never see the AthlonXP 1900+ listed, which is what I supposedly have. I even went to the AMD web site to check on prices, and the 1900+ is not listed. What gives?

—MARQUIS NORRIS

The primary difference between the Palomino Athlon XP and the Thoroughbred Athlon XP is the jump from a 0.18-micron process to a 0.13-micron process. It was simply a die shrink, and any performance differences are negligible. The original Thoroughbred, however, had a reputation for not overclocking well. And because of its smaller die-size and diminished surface area, many users reported problems with keeping it cool. AMD corrected this with its Thoroughbred B, which added another layer that reduced congestion in the core and let it hit higher speeds. Thoroughbred Bs have since been used in many slower-rated Athlon XP CPUs.

The practical upshot of this is that while the Thoroughbred is a better CPU for overclockers, the Palomino is perfectly fine if you're going to run it at the default speeds. A temperature of 112° F isn't at all unusual for this CPU

As for the dearth of info about your Athlon XP 1900+, the CPUs are still readily available. However, most advertisers are likely pushing newer and faster CPUs over the 1900+.

> **THE DOCTOR RECOMMENDS DISABLING ANY SYSTEM TRAY APPS THAT YOU DON'T USE AT LEAST TWICE A DAY.**

WINDOWS ACTS WACKY

I'm having trouble getting my new PC working. It's an Athlon XP 1800+, with 256MB of RAM, and a pair of 40GB Maxtor drives in a RAID 0 array. When I try to install Windows to the RAID array, Windows locks up, even though I use the right drivers for my RAID controller.

If I install Windows to one of the drives without RAID, Windows works OK for a while, but eventually I get crashes when I'm playing *Battlefield: 1942*. The system won't reboot,

and I get an error in NTFS.sys or kern32.sys.

Please help!

—JEREMY COWGILL

The Doctor had a similar problem with one of his machines recently. Assuming you're not overclocking, which can really bork 3D and PCI devices, we'd bet your problem is bad memory. A bad stick of RAM or a faulty slot on the mobo is the most common cause of this sort of problem.

To test it, open your case and remove one stick of RAM, then fire up the PC and see how things run. If that fixes your problem, the RAM you removed is likely faulty. If it's still wonky, swap the stick you removed with the stick that's still in the system, and try again. You should also try the other slots in your mobo.

If your RAM tests OK, your motherboard could be faulty. The only way to confirm that is to swap your mobo with another mobo and see what happens.

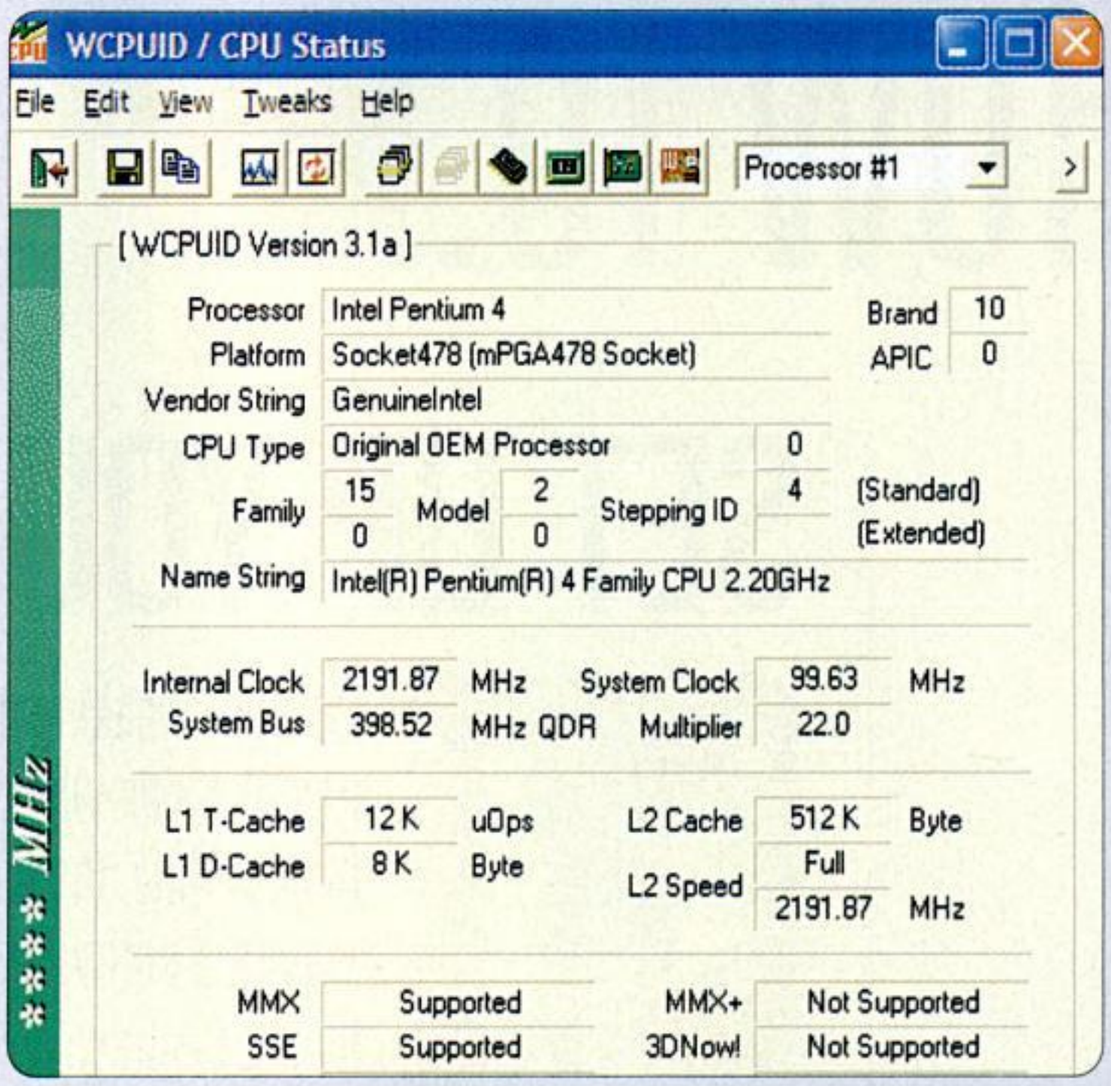
HOW FAST GOETH MY CPU?

I've got a Dell laptop running Win98 SE and just had the motherboard replaced under warranty. The old board had a 500MHz Celeron. I want to know whether the new board has the same chip. Is there a utility that can tell me this?

—MIKE STEPHENS

The application you're looking for is called *WCPUID*. If you search Google for *WCPUID*, you'll find H.Oda!'s home page, where the app is available for download.

***WCPUID* not only tells you how fast your CPU is, but what core type it is, how much L1 and L2 cache it has, and what bus speeds your PC is running at.**


WCPUID / CPU Status
File Edit View Tweaks Help
Processor #1
[WCPUID Version 3.1a]
Processor Intel Pentium 4
Brand 10
Platform Socket478 (mPGA478 Socket)
APIC 0
Vendor String GenuineIntel
CPU Type Original OEM Processor 0
Family 15 Model 2 Stepping ID 4 (Standard)
0 0 (Extended)
Name String Intel(R) Pentium(R) 4 Family CPU 2.20GHz
Internal Clock 2191.87 MHz System Clock 99.63 MHz
System Bus 398.52 MHz QDR Multiplier 22.0
L1 T-Cache 12 K uOps L2 Cache 512 K Byte
L1 D-Cache 8 K Byte L2 Speed Full 2191.87 MHz
MMX Supported MMX+ Not Supported
SSE Supported 3DNow! Not Supported
**** MHz ****

If you've got a CPU and aren't sure how fast it is, download *WPCUID* and get the inside skinny on your processor.

PENTIUM 4 POWER

A couple of online retail sites state that a P4 CPU requires a special chassis and power supply. Most other sites infer this because they list their cases as P4-ready (even the ones that don't have power supplies included). I have a custom-painted Super SC750-A full-tower case, and I'm reluctant to part with it. What, if anything, can I do to use it with a P4 mobo/CPU combo (Asus P4T533-C mobo, if that information is necessary)? I'm assuming I can easily replace the power supply. But what chassis mod, if any, is required?

—JASON DEIBERT

When the initial Pentium 4s shipped, they included special mobo connectors so their massive heatsinks could be mounted directly to the case. Luckily, with today's cooler-running Pentium 4s, the heatsinks can be mounted to the mobo without fear of wrenching the board and breaking things.

The power supply is a different matter, but the good news is that most replacement power supplies these days include the extra 12-volt connector that Pentium 4 mobos require. We recommend the PC Power & Cooling Silencer 400 ATX.

> ***"I CALLED DELL'S TECH SUPPORT AND, AFTER JUMPING THROUGH NUMEROUS HOOPS, ENDED UP REINSTALLING WINDOWS. XP PRO FROM SCRATCH."***

DUDE! MY DELL'S GOT DUAL PERSONALITIES!

I recently purchased a Dell computer that did not work correctly. I called Dell's tech support and, after jumping through numerous hoops, ended up reinstalling Windows XP Pro from scratch. Before doing so, the support staff had me do a full format of the drive. Now, when booting the computer, I get a "Dual-boot" text screen asking me to select which operating system to boot, either "Windows XP Professional" or "Windows XP Professional." This delays bootup and is annoying as well. Is there any way to get rid of the dual-boot message?

—TOM FAIR

The Doctor's covered this one before, but it's been a while. First, try booting from both the first and second menu choices. Once you know which one (or both) work, boot into Windows XP and open System Properties by pressing Windows and Pause/Break. Go to the Advanced tab, then press the Setting button in the Startup and Recovery section. Click the Edit button on the screen that pops up. In the Notepad window that opens, you'll see several lines of text under the [operating system] section. Delete the line for the OS you want to get rid of, and your extra boot option will disappear quicker than Steven the Dell Dude.

SERVER SHENANIGANS

I've got a small home network with five machines, and I'm trying to figure out what type of machine to build as my server. I want the machine to be an e-mail, web, and file server, and that's it. I'll run Windows XP on it. Do you have any thoughts about the necessary processor speed, amount of memory, and hard disk configuration (e.g., 5400rpm vs. 7200rpm)? Finally, are there any other items I should consider when specing out this machine?

—MICHAEL FEINSTEIN

Several editors at *Maximum PC* run small personal web and mail servers at home, on very modest hardware. A 500MHz Pentium III with at least 256MB of RAM is more than sufficient for most small web servers. If you plan on using the machine as a NAT router too, you'll need to make sure it has two Ethernet cards—one will connect to your DSL or cable modem, and one will connect to your internal LAN.

The place to spend a couple bucks is on your hard drive. For reliability, get an inexpensive SCSI drive or a high-end IDE drive. Running a 7200rpm drive is nice, but it's not as crucial as having a drive you can depend on. ■

Have a burning PC problem? How about a burning PC sensation? We're more than happy to help you with your PC problems, but you might want to get that sensation thing checked out by a qualified sensation checker-outer. If you have PC questions, send them to **doctor@maximumpc.com**. Just remember: We can't answer every e-mail. Oh, *no*—not by a long shot.

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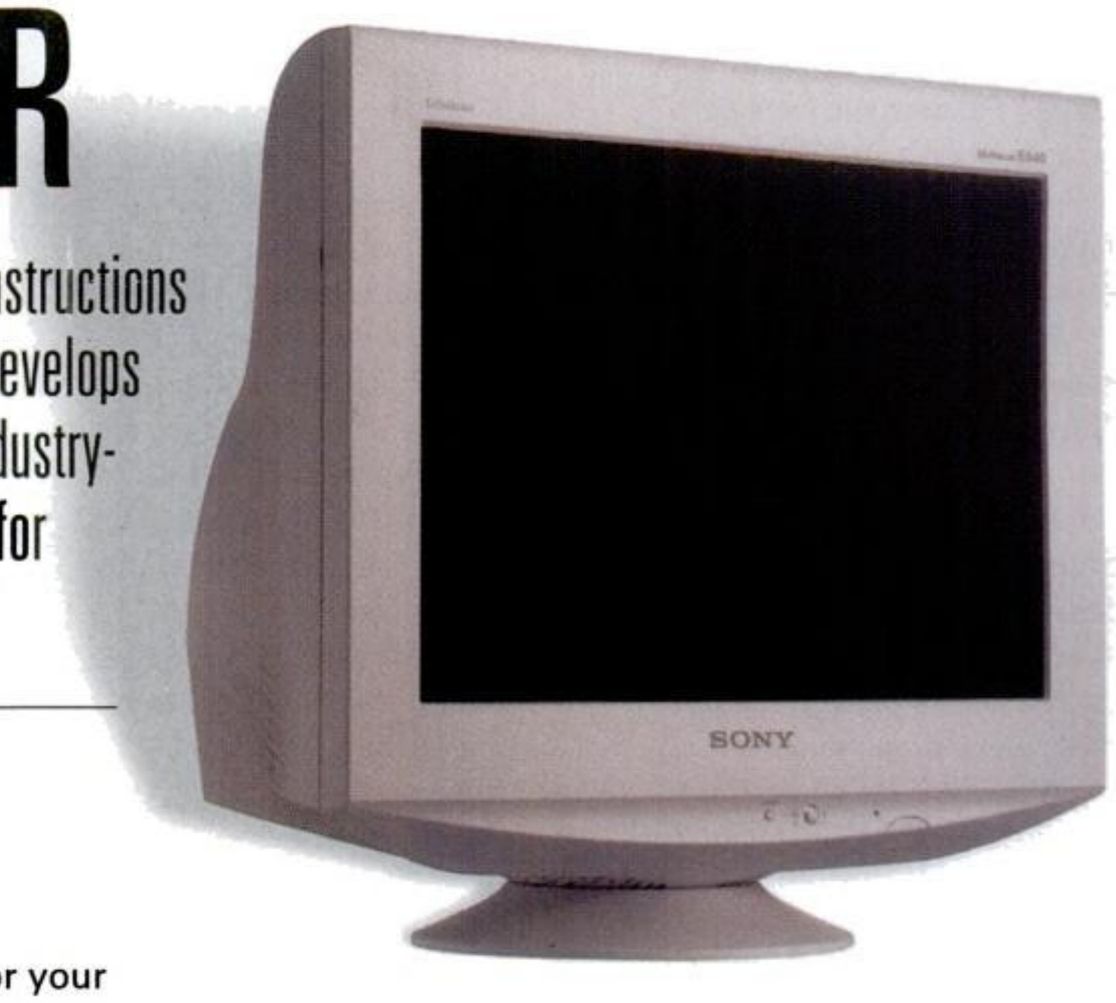
How To...

A step-by-step guide to tweaking your PC Experience

SET UP YOUR CRT

Monitor tweaking instructions from the man who develops DisplayMate, the industry-standard software for tuning displays



MAXIMUMPC
TIME TO COMPLETION
01:00
HOURS MINUTES

BY RAYMOND M. SONEIRA

Preliminaries

First, it's important to select the right location for your CRT. Make sure the screen isn't facing any windows or areas of high glare. Position the monitor so that the screen is about 18 to 24 inches away from your face, with the top of the screen just below eye level.

Use a single video cable—extension cables will degrade the image quality substantially. Use the shortest cable length that will work. Compared with the standard VGA DB-15 cable, BNC-5 cable connections provide noticeably better image quality only with cable lengths greater than 15 feet. So for short runs, the standard 6-foot cable that comes with most monitors will likely do fine.

As for the optimum room lighting, use indirect, medium-intensity lighting that's neutral in color. If possible, have the wall area behind your monitor gently backlit. Excessively dark environments or fluorescent lighting will heighten your eye's flicker response.

Set the Refresh Rate

Set the refresh rate to the lowest rate that doesn't produce any annoying or uncomfortable flicker sensation. For just about everyone, this is 75Hz. Setting it lower than this value isn't recommended. Setting the refresh rate higher than necessary will needlessly degrade image sharpness due to video bandwidth effects (the pixel clock rate increases with the refresh rate, and this can lead to blurriness). Of course, if you're a 3D gamer and a low refresh rate is bottlenecking your frame rates, follow your best judgment when raising rates.

To check for subliminal flicker that's slightly below your threshold of sensation, you need to maximize the conditions needed for detection. First, turn off all of the lights, then look at a screen that is predominantly peak white, such as a blank page in a word processing program. Now, turn up the Contrast control to maximum, and put your face close to the screen. If you experience a fluttering brightness sensation, you may need to increase the refresh rate.

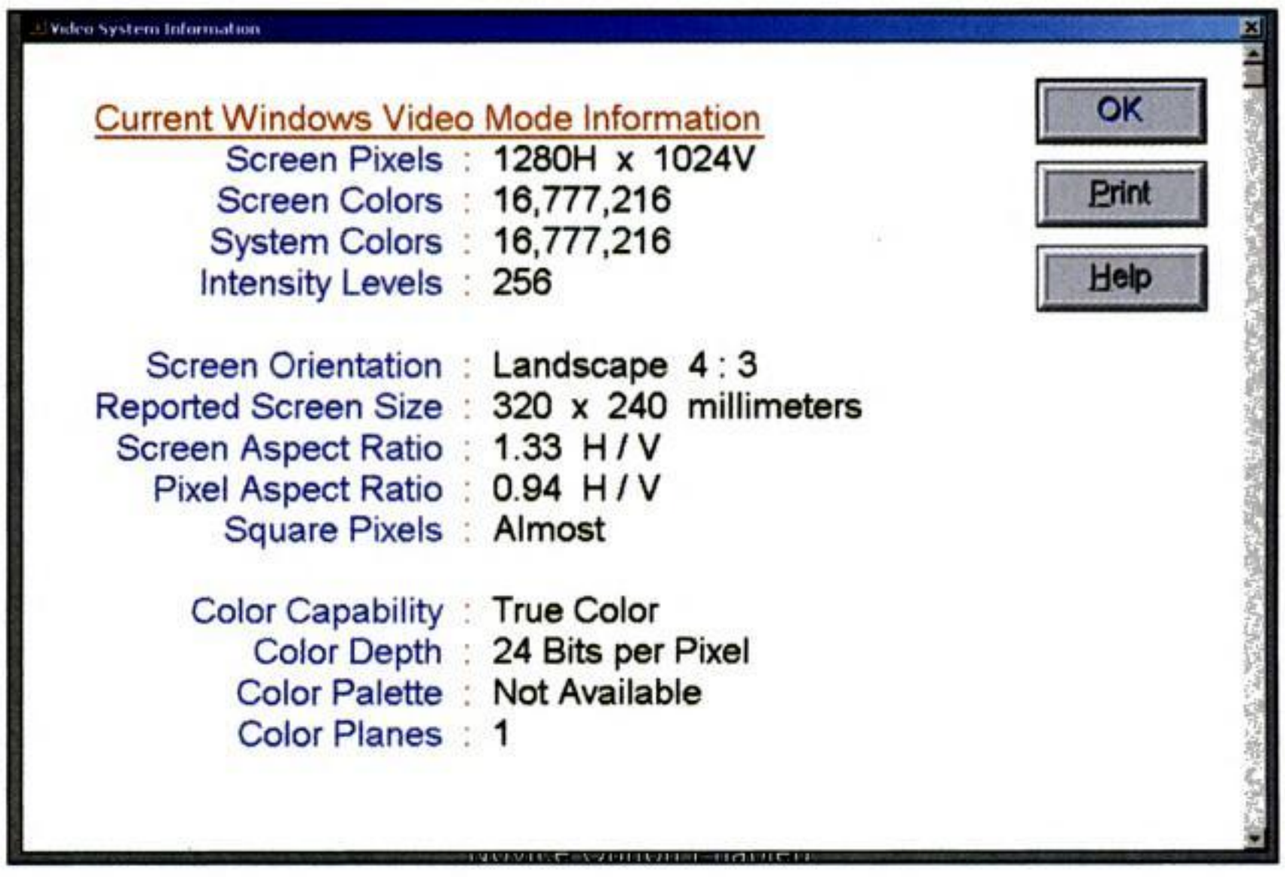

Video System Information
Current Windows Video Mode Information
Screen Pixels : 1280H x 1024V
Screen Colors : 16,777,216
System Colors : 16,777,216
Intensity Levels : 256
Screen Orientation : Landscape 4 : 3
Reported Screen Size : 320 x 240 millimeters
Screen Aspect Ratio : 1.33 H / V
Pixel Aspect Ratio : 0.94 H / V
Square Pixels : Almost
Color Capability : True Color
Color Depth : 24 Bits per Pixel
Color Palette : Not Available
Color Planes : 1
OK
Print
Help

Figure 1

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Set the Resolution and Aspect Ratio

One of the great advantages of CRTs is that they perform nicely over a wide range of resolutions and aspect ratios. Here are the recommended operating resolutions for typical CRT monitors:

- 17-inch: 1024x768 to 1152x864
- 19-inch: 1152x864 to 1280x1024
- 21-inch: 1280x1024 to 1600x1200

Your videocard also plays an important role in image quality. For the higher resolutions be sure to use a high-end graphics board.

Note that the popular resolution of 1280x1024 has a native aspect ratio of 5:4=1.25, which is noticeably smaller than the 4:3=1.33 native aspect ratio of almost all CRTs. Most CRT users will fill the screen at this resolution, stretching the image horizontally, resulting in non-square pixels. That's OK most of the time, but may result in aspect ratio errors for some applications; circles will appear slightly elliptical, for example. In photographic images, people will appear 7 percent fatter.

It's also important to find out what Screen Aspect Ratio the Windows driver is reporting. For most resolutions it should be 4:3=1.33, but it's important to check because it's sometimes wrong. For example, on my brand-new Dell Inspiron notebook, the Driver reports a 1.40 Aspect Ratio when it's actually 1.33. At 1280x1024, it's a toss-up whether you'll see 1.25 or 1.33. If you have an LCD, it should be 1.25, and if you have a CRT it should be 1.33. You can use any *DisplayMate* product (including the demo) to check this. Select "Video System Information" and look under "Screen Aspect Ratio" (see figure 1). If it's wrong, call the manufacturer to get an updated driver with the right value.

Degauss the Screen

All CRT color monitors are affected by the Earth's magnetic field and need to be regularly degaussed. Monitors automatically do this when they are turned on (that's the source of the buzzing sound). Many CRT monitors also have a front-panel Degauss button or a menu option to do this manually. If you keep your monitor on all the time, you should hit the button periodically. The schedule will depend on both your monitor and the magnetic environment it's in. If you notice a change after degaussing, do it more frequently. If not, do it less frequently. Moving the monitor or allowing any steel objects to come near it also calls for immediate degaussing. Please note that you can get only one full-power degauss about every 20 minutes.

Keep magnetic appliances away from your monitor. Also keep all of those black box transformers and power supplies away from the monitor. Finally, nearby CRTs can affect each other, so try to keep them at least a foot apart.

We're Almost Ready to Tweak

Most monitors need a full 30 minutes to warm up and stabilize. Make sure the monitor has warmed up before you begin setting the controls. You should also record all your existing monitor control values. If your control settings show digital values, record them so you can restore the values should you need to later on.

Most monitors have a menu selection to restore all settings back to their factory values. Consider resetting the monitor if you're having trouble with it, or if it was attached to another computer previously. Otherwise, it's probably best to keep the current values so you're not starting from scratch.

The settings for most of the controls interact to varying degrees, so you may need to go through this setup procedure more than once. Familiarize yourself with all the available user controls by either reading the manual or systematically going through each of the onscreen menus and buttons. Some buttons may have special dedicated functions when you're not in menu mode, so check each one out in turn. For a quick first pass, roughly set the Brightness, Contrast, Size, and Position controls so they look about right. We'll set each one more carefully in due time.

DisplayMate

DisplayMate software is designed to help you set up and tune monitors for optimum image and picture quality using all the controls available on your monitor and videocard control panel. It does this with a series of specialized test patterns that you look at while making adjustments. Each test pattern within *DisplayMate* includes a Test Information screen that tells you what to look for and what adjustments to make. In many cases, the software can help you work around image-quality problems.

DisplayMate for Windows is designed for non-experts. *Maximum PC* uses the advanced *DisplayMate Multimedia Edition* for testing and reviewing monitors in the magazine. As a bonus, DisplayMate Technologies and *Maximum PC* are making available a free, limited-function demo version of *DisplayMate* with six sample test patterns that will help you get started. It's available on this month's Maximum CD and at MaximumPC.com.

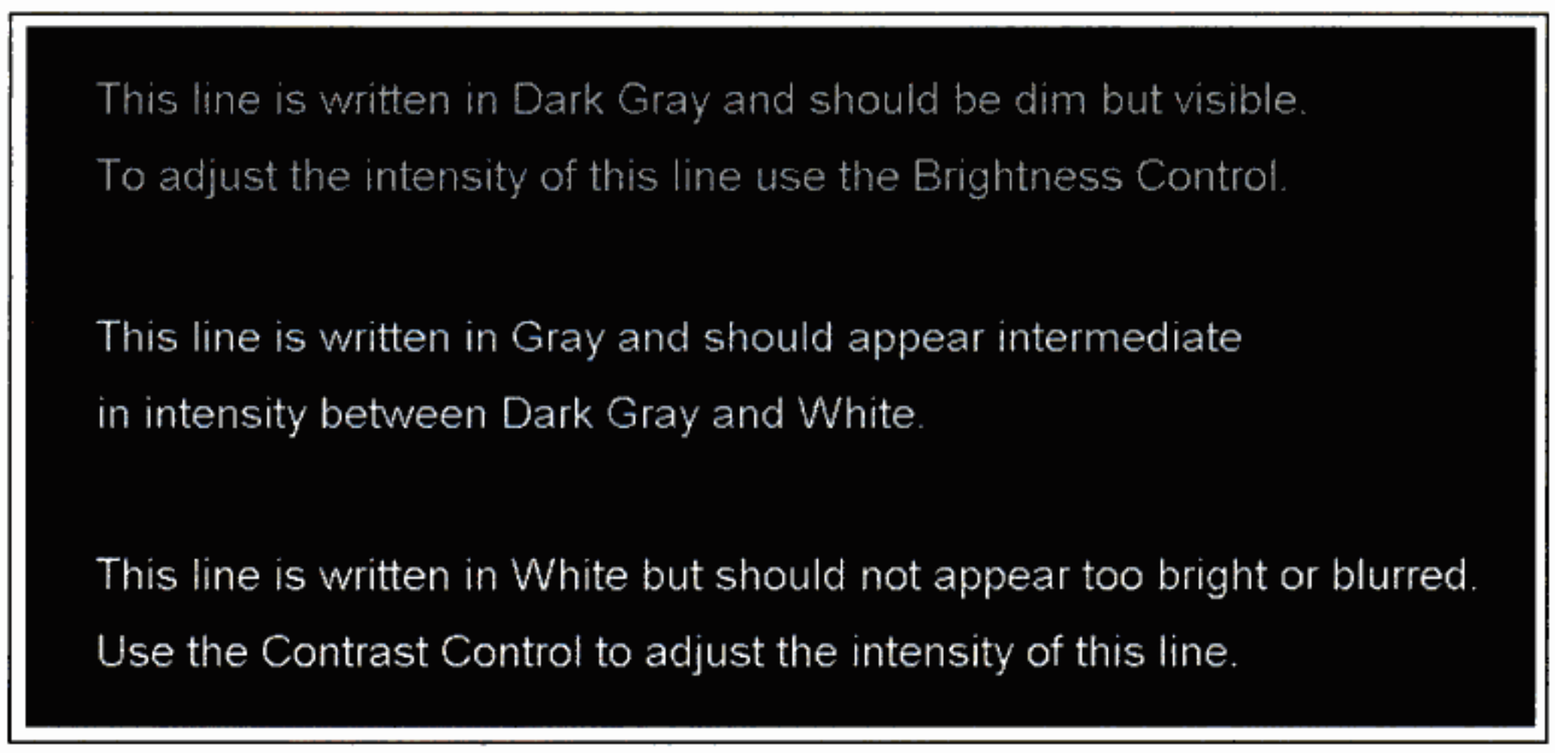
This line is written in Dark Gray and should be dim but visible.
To adjust the intensity of this line use the Brightness Control.
This line is written in Gray and should appear intermediate
in intensity between Dark Gray and White.
This line is written in White but should not appear too bright or blurred.
Use the Contrast Control to adjust the intensity of this line.

Figure 2: Brightness and Contrast

Brightness Control

Your CRT's brightness control is poorly named because it has very little effect on the screen brightness. In fact, it's used to adjust the black-level of the monitor so that the dark end of the gray-scale is properly reproduced. If it's set too low, the darkest grays are reproduced as black instead of gray. If it's set too high, black

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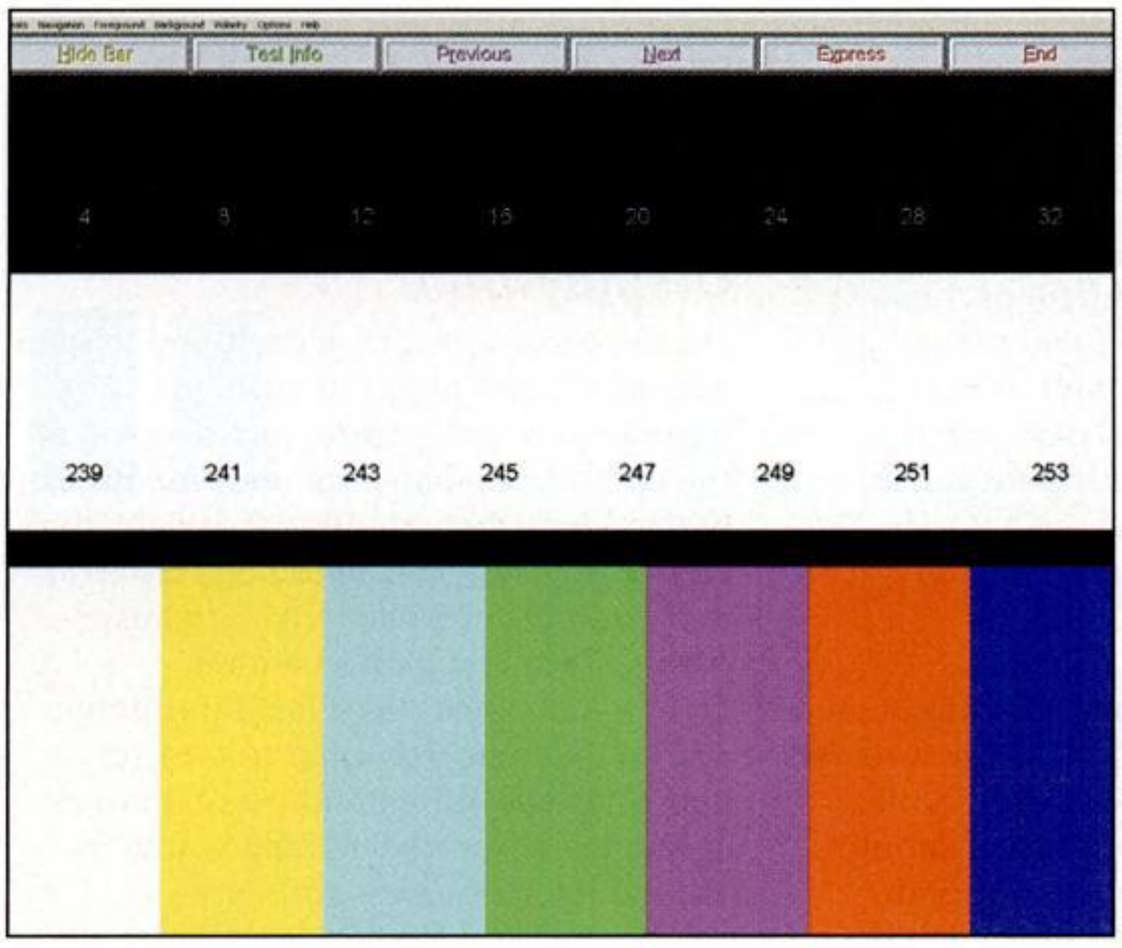

Figure 3: Extreme Gray-Scale

is reproduced as dark gray. This is bad, because losing the ability to produce black significantly reduces the contrast capability of the monitor.

Accurately setting the brightness control is the single-most important adjustment on any display. *DisplayMate* includes a number of test patterns that help you accurately set the black-level of the monitor. The first screen in the *DisplayMate* demo, "Brightness and Contrast Adjustment," includes dark gray, light gray, and peak white text that tells you how to make the initial adjustments of both the brightness and contrast controls (see figure 2). Basically, you increase the brightness control until the screen background becomes just visible. Then you decrease it until the background becomes black again. The second test pattern in the demo, "Extreme Gray-Scale," will guide you through making a more accurate setting of the brightness control (see figure 3). Look at the top row of dark blocks, labeled 4 to 32. Adjust the Brightness control so you can see just the 8 Block, and the 4 Block is indistinguishable from the black background.

Contrast Control

The contrast control sets the monitor's peak brightness. It controls the white-level but has little effect on the black-level. If the monitor appears too bright to you, use the contrast control to lower the brightness to a more comfortable level. On the flip side, you have to be careful about turning up the contrast control too high because the image can be substantially degraded. Here's the proper setup method: On the demo test pattern "Extreme Gray-Scale," increase the contrast control until the 251 or 253 Blocks are indistinguishable from the white background. Now back it off until they just reappear. On some monitors you may reach the maximum limit for the control before this happens. Don't worry, that's perfectly fine. If the image is now too bright for comfort, decrease the contrast control until the screen looks good to you.

Next, in the demo, look at the first "Brightness and Contrast" screen. The text that's written in bright white should appear almost as sharp as the text written in gray. If it appears blurred, you'll need to reduce the Contrast Control until the text appears relatively sharp again. Now move to the second test pattern, "Extreme Gray-Scale." Look at the frame that encloses the dark and bright blocks at the top of the screen. If there's a kink in the frame, with the bright row appearing wider than the dark row, then there is a screen regulation problem. Decrease the contrast control until this effect mostly goes away.

Size and Position

Your next step is to carefully frame the image on the screen. Adjust the Horizontal and Vertical Size and Position controls to fill the screen almost to the outer edge. Leave one or two millimeters of border space to allow for some variation and drift in the image. If the monitor isn't performing well, it may be best to restrict the image size and stay away from the edges of the screen. Use the "Screen Framing and Aspect Ratio" test pattern (available in all *DisplayMate* products) for the adjustments (see figure 4).

Geometry

Most monitors will provide additional controls to reduce or eliminate different types of geometric distortion. The controls you're most likely to find are pincushion (which gives the monitor a waist at the middle); bow (similar to pincushion, but both sides curve in the same direction); keystone (like a trapezoid); skew (like a parallelogram); and rotation. Play with each control so that you understand exactly what each one does.

DisplayMate has quite a few specialized test patterns for adjusting screen geometry. If you're using the *DisplayMate* demo, bring up the "Screen Framing" test pattern.

(a) The first control to adjust, if you have it, is screen rotation. Adjust the control so that the line at the bottom of the frame is as parallel as possible with the edge of the screen. If there is any curvature along the bottom or top of the frame, you'll need a vertical pincushion adjustment (which is seldom found on low-end monitors).

(b) Because all monitors have either flattened or perfectly flat screens, they all experience pincushion distortion that needs to be electronically removed. Most monitors give you a horizontal pincushion control. If it's turned too low, the frame will be pinched in on both sides; if it's turned too high, the frame will be turned out on both sides and look like a barrel. Adjust it so that both sides are as straight as possible. It's likely that both sides won't be perfectly symmetric, so pick the best compromise.

(c) Many monitors will have a Bow or Pincushion Balance Control that will let you adjust the left and right sides of the frame so that the pincushion is symmetric. After you do this, go back to step (b)

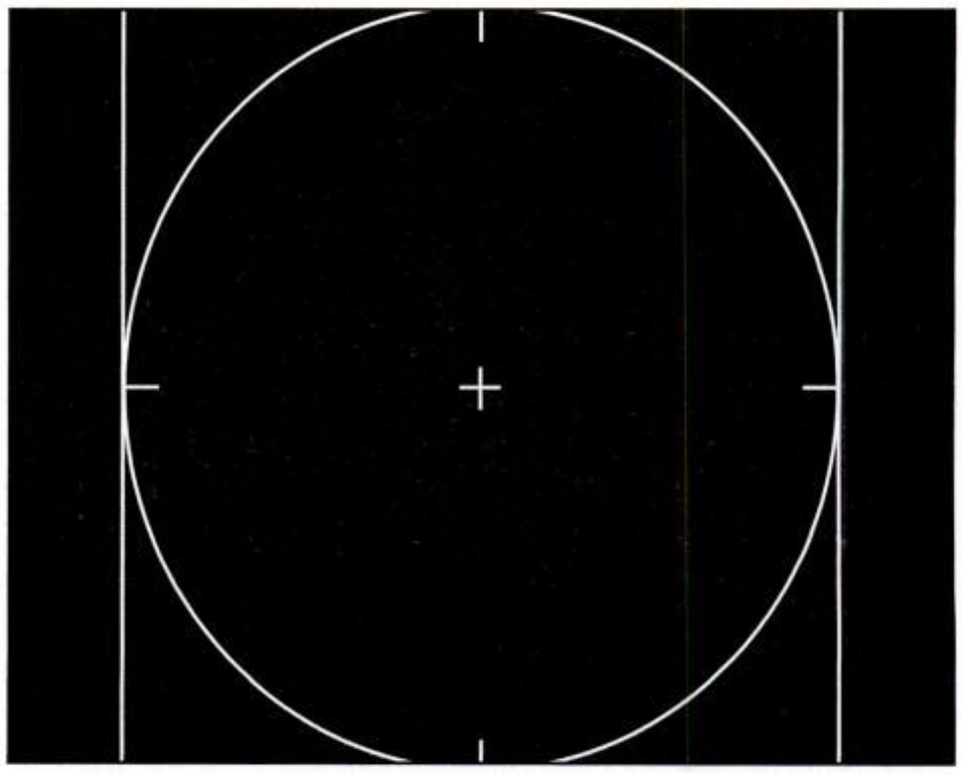

Figure 4: Screen Framing and Aspect Ratio

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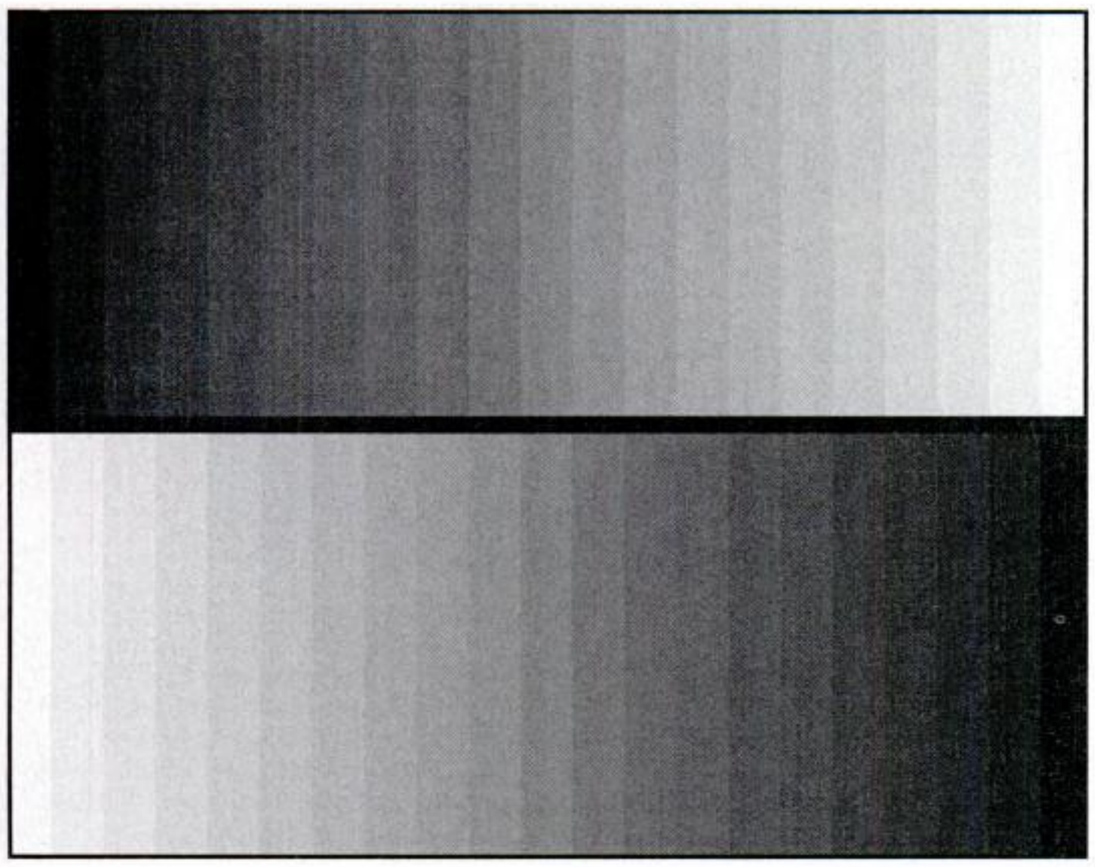


***DisplayMate's* various grayscale ramps (found in the full versions) graduate from five to 256 steps, and can teach you volumes about your monitor's ability to properly render gray tones (which are important in photographic images).**

above and repeat it. Then repeat this step also.

(d) If the top and bottom sides of the frame aren't the same length, use the Keystone control to make them equal.

(e) If the left and right sides of the frame aren't square, use the Skew control to transform the parallelogram frame into a square frame.

(f) Because the Keystone and Skew controls interact significantly, you'll need to repeat steps (d) and (e) until you find the best compromise.

(g) All of the geometry controls interact to some degree, and by jockeying each of them a bit, you can generally improve your screen image. For example, if there's some residual pincushion curvature that you just can't seem to get rid of, use the Keystone and Skew controls together with the Pincushion and Bow controls to reduce it. You're transferring geometric errors from one place to another so that they all balance out as best as possible. It's all about managing visual error budgets.

Convergence

A color CRT is actually made up of separate red, green, and blue displays inside a single tube. The images all have to line up really well in order to show fine detail. For example, on a 17-inch display at 1024x768, the individual pixels are just a bit more than 1/100th of an inch apart. The alignment of the red, green, and blue primaries is called convergence. Their misalignment is called misconvergence, which leads to color fringing and loss of sharpness.

For example, if red and green aren't perfectly converged, when you draw a yellow line it will have a red fringe on one side of the yellow core and a green fringe on the other. Similarly, when you draw a black character on a white screen, and R, G, and B aren't properly converged, the black strokes will be filled in to some degree, and the image will look a bit colored and fuzzy. Convergence is very important, but bear in mind that no monitor is ever perfectly converged. Generally, convergence is best at the center, and worst in the corners.

If your monitor includes Static Horizontal and Vertical Convergence controls, you can control the overall alignment of the red, green, and blue images. They won't fix problems in any one particular part of the screen, but will allow you to adjust the relative alignment over the entire screen. Most of the time you want the best agreement at the center, but if one part of the screen is really bad, you have the option of improving it at the expense of the other parts of the screen. It's a compromise, and you have to decide on your error budget.

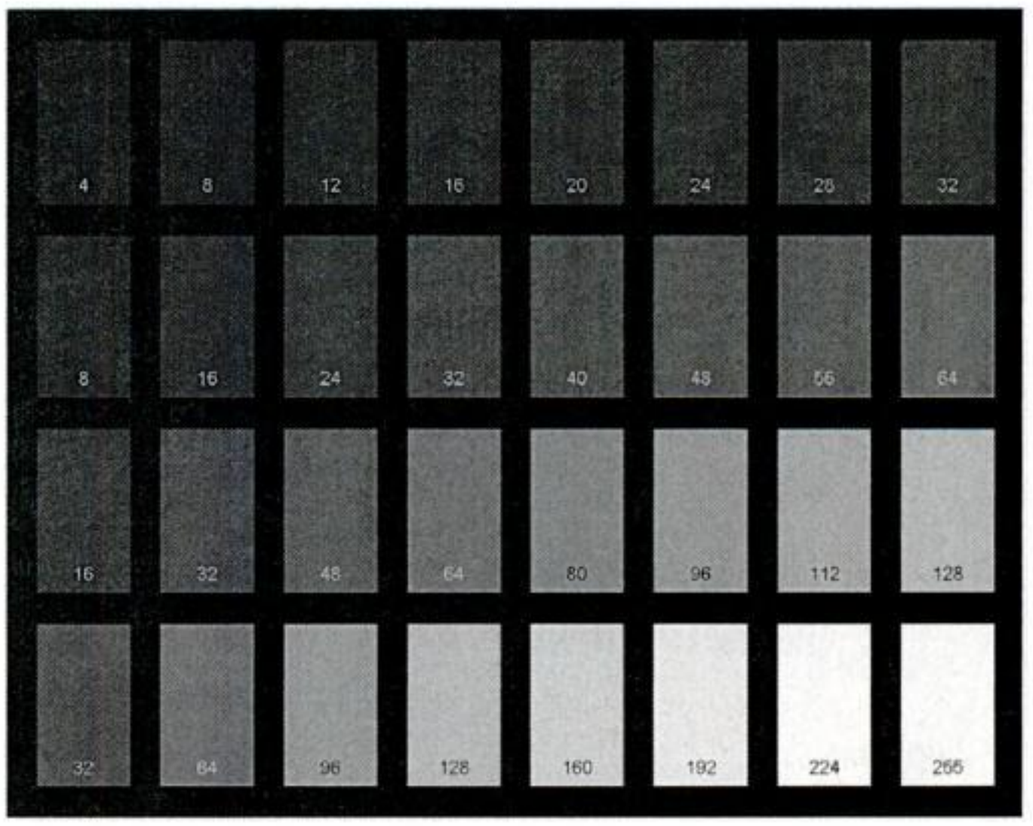
Green is the brightest of the primaries, so red and blue are varied for the best agreement with green. *Display Mate* has a number of very sensitive test patterns for detecting misconvergence. In the demo, you can use the "Screen Framing" test pattern to adjust the Static Convergence. Convergence is generally worst on the outer borders, particularly the corners, so use the outer frame to look for color fringing around white. The central cross lets you check for color fringing at the center. Vary the Convergence Controls to see how they affect the fringing. Find the setting that provides the best overall convergence. For higher sensitivity, switch from white (which has all three primaries) to one of the secondary colors, like magenta (which is made up of only red and blue, and will let you track more easily the two colors that are generally off the most).

Moiré Reduction

Annoying moiré interference patterns arise from interactions between the pixels in an image and the phosphor elements (the red, green, and blue dots or lines) that coat the screen. All CRTs have some degree of moiré, and in fact, the sharper the CRT, the stronger the moiré will be. Fortunately most monitors have some form of moiré reduction control. Because moiré reduction actually blurs the image a bit, you want to use the least amount that works.

To adjust for moiré, you first need a pattern that accentuates the moiré; *DisplayMate* has a dozen moiré test patterns that you can use. The *DisplayMate* demo has a pattern for adjusting pixel tracking on LCDs that will also let you adjust for moiré on a CRT. First turn off the moiré reduction, or set it to zero. Slowly increase the moiré reduction until the wispy pattern weakens significantly. Don't try to make it go away entirely. If you overdo it, you will wind up blurring the image excessively. ■

Dr. Raymond M. Soneira is President of DisplayMate Technologies Corp. For more information, go to www.displaymate.com.



The color tracking screen, found in the full versions of *DisplayMate*, helps you identify color-tint variations in otherwise neutral grays.

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TC1-6500	Adapter 80 Pin SCSI to 68 Pin SCSI	$9.99
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L49-5000P	LG GCC-4480BB 48x24x48x16x CD-RWDVD Combo Drive	$79.99
B203-1058	BMI Toshiba 2x DVD-R/RW Internal EIDE Recorder	$199.99
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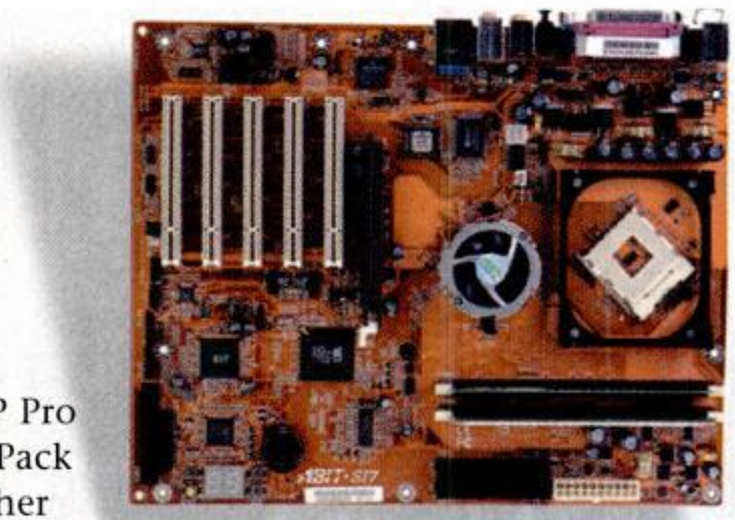
In the Lab

A behind-the-scenes look at Maximum PC testing

Rambus: One More Hurrah

Can the new RDRAM chipset from SiS embarrass Intel's DDR initiative?



The SiS R658 chipset will be offered exclusively in Abit's SI7 motherboard pictured here.

As we reported in last month's "System Bus 800" story, Intel has rescinded RDRAM's "most favored memory technology" status, and will for the foreseeable future exclusively support dual-channel DDR in its new high-performance desktop chipsets. This spells the end of Rambus-lovin' at Intel HQ, but RDRAM hasn't been completely abandoned by industry players. This month, we got a chance to benchmark SiS's new R658 chipset, which joins the Intel 820, 840, 850, 850E, and 860 chipsets in the RDRAM pool of users. The R658 officially supports 400MHz and 533MHz bus-speed CPUs, up to 2GB of memory, and AGP 8x. But can it hold its own against the new Intel 875P, which supports dual-channel DDR400?

Our experience with the SiS R658 came by way of Abit's SI7 motherboard, which exposes a ton of memory tweaking options that we've never seen in any 850 or 850E RDRAM mobo. And like Asus' odd duck P4T533 board (not to be confused with the P4T533-C), the Abit SI7 board uses RIMM4200 technology.

"Alas, for I am the R658, and I will not let Rambus die!"

RIMM4200 (and the slower RIMM3200 technology) shoehorns two PC1066 modules into a single memory stick. This eliminates the necessity of running sticks in pairs, and helps cut down on extraneous circuitry runs. The Abit SI7 we tested featured an early engineering BIOS, but Rambus felt that the board was worthy of benchmarking.

We fitted the SI7 with an ATI Radeon 9700 Pro, a Western Digital WD1200JB hard drive, and 512MB of PC1066 RDRAM, and loaded it with Windows XP Pro and Service Pack 1. All the other boards tested for this article received the same load-out of hardware, though memory types of course differed.

When all the CPU fans had spun down, the SiS R658 was left wearing the stupid cap. Even though it's a modern chipset (and a full year younger than the 850E, Intel's reliable RDRAM warhorse), it still came in dead-ass last in every test we ran. It even trailed SiS's own R655 dual-channel DDR chipset, which we tested with both DDR333 and DDR400 memory. Driver and BIOS issues could explain why the R658 did so poorly, but it's also possible that the chipset just isn't any good. With last-place performance that puts it in a class with Intel's DDR266 E7205 chipset, we don't expect much interest in the SiS R658. It requires the extremely rare RIMM4200 modules and doesn't offer any competitive edge over Intel's RDRAM chipsets.

That said, RDRAM fans shouldn't start taking down the party decorations just yet. We suspect that SiS is treating the R658 chipset as a proof of concept of sorts. The real day of reckoning for RDRAM on the desktop will be when SiS releases the R659 sometime this fall. The R659 will be a quad-channel RDRAM chipset that may give dual-channel DDR400 and possibly even DDR-II a run for the money.

R658 VS. THE WORLD

Chipset	SiS R658	Intel 875P	Intel 850E	Intel E7205	SiS 655	SiS 655
Motherboard	ABIT SI7	Intel D875PBZ	Intel D850EMV2	Gigabyte 8INXP	Gigabyte SINXP1394	Gigabyte SINXP1394
CPU	3.06GHz P4B	3GHz P4C	3.06GHz P4B	3.06GHz P4B	3.1GHz P4B	3.1GHz P4B
Bus speed	533MHz	800MHz	533MHz	533MHz	540MHz	540MHz
RAM type	Dual PC1066	Dual DDR400	Dual PC1066	Dual DDR266	Dual DDR333	Dual DDR400
RAM clock speed	1,066MHz	400MHz	1,066MHz	266MHz	333MHz	400MHz
Theoretical memory bandwidth	4.2GB/s	6.4GB/s	4.2GB/s	4.2GB/s	5.4GB/s	6.4GB/s
Quake III Arena normal settings, audio disabled	349.1 fps	**407 fps**	361 fps	358 fps	364 fps	353 fps
SYSmark2002 Overall	288	**315**	301	296	313	302
SYSMark2002 Internet Content Creation	414	**438**	421	417	429	419
SYSMark2002 Office Productivity	201	226	215	210	**229**	218
SiSoft Sandra 2003 INT	3133MB/s	**4911MB/s**	3354MB/s	3312MB/s	3436MB/s	3371MB/s
SiSoft Sandra 2003 FLOAT	3132MB/s	**4945MB/s**	3347MB/s	3311MB/s	3445MB/s	3371MB/s
3DMark2001 SE Patched Overall	15,137	**16596**	15504	15276	15663	15394
3DMark2003 Overall	4,783	**4870**	4778	4761	4829	4814

Bold indicates best score.

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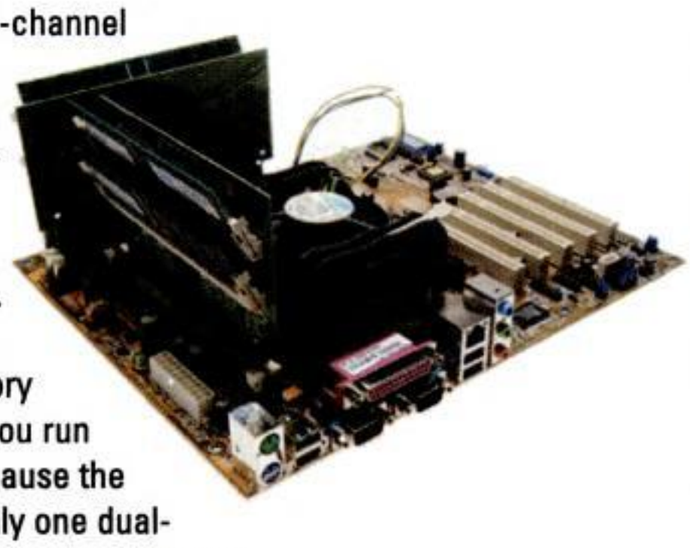
Anti-Friction Liquid

When we originally received it in the mail, we thought Anti-Friction Liquid—formerly known as Mouse Wax—was nothing but an April Fool's joke. Mouse lubricant? To make the darned things glide over surfaces better? You have *got* to be kidding.

But then we tried the stuff, and found that it actually *did* make mouse movement noticeably smoother. To apply Anti-Friction Liquid, simply put a drop on each of your mouse's glide pads, and then rub it in with a Q-Tip. We found that an application lasted from one to two weeks. While the original product name suggests that the product uses wax, the special ingredient is actually a top-secret silicone (not silicon) compound. **$8, www.func.net**

Dr. Ungenstein's Monster

Here's what happens when our senior editor tries to hand-craft a dual-channel PC133 mobo



Ever wonder why no one ever made a dual-channel PC133 chipset? That question periodically rumbles through the Lab, so we decided to simulate our own dual-channel PC133 platform. We requisitioned a set of PC133-to-RDRAM converters from Harddrive.com, and filled them with Crucial PC133 SDRAM. The converters are actually old Asus RAM converters that use the ill-fated Intel memory translator hub, which was intended to let you run SDRAM in 820 motherboards. Anyhow, because the converters were so large, we could find only one dual-channel motherboard that accepts them: the Asus P4T533-C.

Unfortunately, while our contraption *looks* impressive, it doesn't work. Our grand experiment failed when the board refused to POST. We didn't think it would work, but figured we'd give moldy-old SDRAM one more chance to shine.

Best of the Best

As of June, 2003

Here are our current top picks in each hardware category. Red text indicates first month on chart. Of note this month is the addition of a P4 mobo with an 800MHz frontside bus, and an updated Athlon XP board. Previous versions of the A7N8X Deluxe may not fully support the 400MHz frontside bus speeds that nVidia touted as part of the nForce2 chipset. Check back next month for updates.

High-end videocard:
ATI Radeon 9800 Pro

Budget videocard:
ATI Radeon 9600 Pro

Do-everything videocard:
All-in-Wonder 9700 Pro

Soundcard:
Sound Blaster Audigy 2 Platinum

Hard drive:
Western Digital 360GD Raptor

CD-RW drive:
Plextor PXW4824TA/BPS

DVD burner:
Sony DRU-500A

LCD monitor:
Sharp LL-1820

CRT monitor:
Sony F520

P4 motherboard:
Intel D875PBZ

Athlon XP motherboard:
Asus A7N8X Deluxe Rev 2

Portable MP3 player:
iPod 20GB

Photo printer:
Epson Stylus Photo 1280

Pocket PC PDA:
HP iPaq 5450

5.1 speakers:
Logitech Z-680

4.1 speakers:
Logitech Z-560

2.1 speakers:
Klipsch Promedia 2.1

The games we're currently playing: *Battlefield 1942 Desert Combat Mod, Freelancer, Enclave, Tom Clancy's Splinter Cell*

Name That Dingus!

In the spirit of this month's Geek Quiz, we grabbed a strange-looking object from the Lab, and asked some non-PC-savvy co-workers to reveal the object's name and nature. World-class BS'ing ensued.

Juliann Brown, associate art director, Official X-Box Magazine:

"This? This thing here? This would be the rear-mount tory flange from a circa-1965 Heathkit EC-20. I'll take it off your hands for two-fifty."

Kevin Dellasante, manager, Le Gourmet Deli:

"You're good. You are *gooood*. I haven't seen a copper-plated Firby bushing since I was doing contract work for the NSA. I must have rebuilt 300 of these bad mothers."

Christine Ohlert, accounts payable supervisor, Future Network USA:

"At first glance, you have an immaculate, period-correct example of a Noyd & Kiernan knurl buckler. A closer inspection, however, reveals a modern patina, so I must regretfully appraise this a very cunning, but worthless, reproduction."

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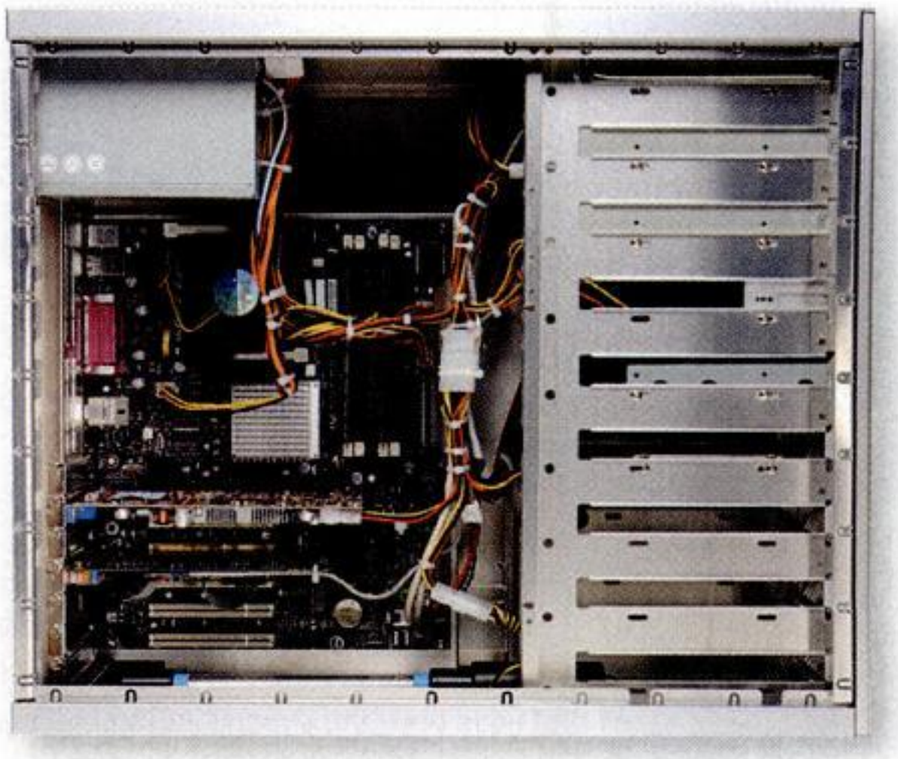
IBuypower Titanium XP

The 800MHz bus pays off



The iBuypower packs a punch for the price.

What's more important? Memory bus bandwidth or CPU clock speed? We thought we'd get the answer when we received iBuypower's Titanium XP box equipped with Intel's hot new 3GHz Pentium 4C. This machine runs a smoking 800MHz system bus (care of Intel's dual-channel DDR400 875P chipset), and serves as an interesting foil to the OC System rig on the facing page.

OK. If you already read our review of the OC System, you know it crashed in all the worst places. But by looking at the benchmarks it successfully completed, and comparing them with those of the Titanium XP, we can divine a thing or two about the relative merits of CPU speed and bus bandwidth.

Take, for example, the performance of the OC System in *MusicMatch*. In this test, we convert a WAV file to a high-quality MP3, a process that leans almost exclusively on the CPU. As expected, the 3.6GHz in the OC System didn't disappoint—it finished its conversion run in 208 seconds. The Titanium XP, despite its 800MHz bus, required an additional 27 seconds.

But the CPU clock-speed advantage didn't help in *SYSmark2002*. In this comprehensive test suite based on 14 real-world office and content creation apps, the bandwidth-happy Titanium XP sailed past the OC System with a score of 320 versus 310. Just think about it: Even with a CPU clock-speed advantage in excess of 500MHz, the OC System still lost.

Unfortunately, the test comparisons stopped there thanks to the spectacularly unstable nature of the OC System.

Feature-wise, the Titanium XP is well-outfitted, with just a few warts. We think jamming silver gunk into a front USB port is just plain hooptie. We suspect that when iBuypower rigged up its ports, it ran out of USB headers on the motherboard. So, instead of leaving one port dead (which is what OC System did), someone just plugged some gum, or paper, or secreted alien goo into the port to keep us from using it.

We were also bummed that iBuypower didn't throw in a SATA hard drive. The 120GB Western Digital drive is a nice consolation, but 120GB is rather small for a high-end system these days. The company also skimped by going with an OEM Audigy soundcard rather than an Audigy 2. Finally, iBuypower made the same error ABS made last month—it went with Klipsch's GMX D-5.1 speakers, which don't support 5.1 discrete channels in games when hooked up to the Audigy.

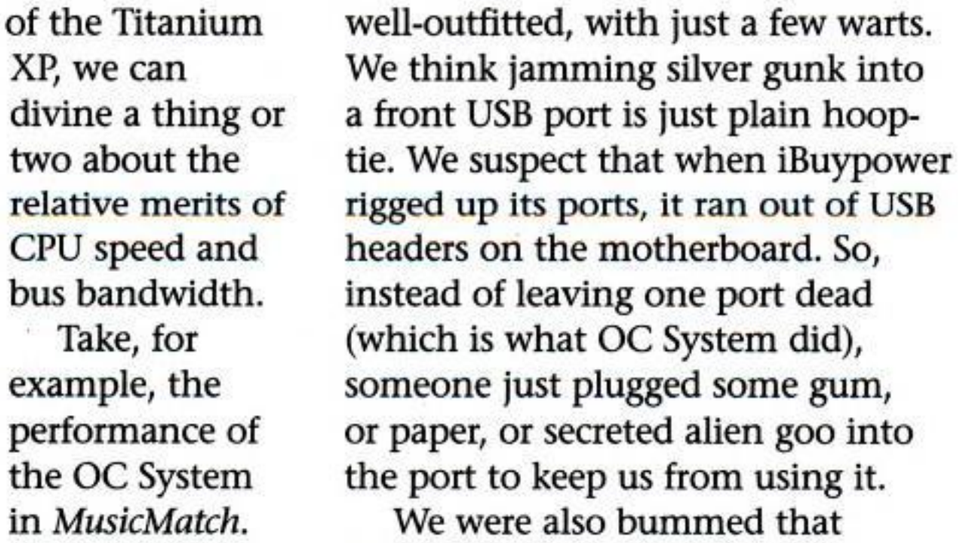
On the plus side, the Titanium XP features an Intel D875PBZ "Bonanza" mobo like the one reviewed on page 65, an ATI Radeon 9800 Pro, and 1GB of Kingston DDR400. We also dig the rig's RaidCom case. Featuring eight full-size drive bays, it's a welcome change from the "me-to" Lian Li and Cooler Master copies. The case is sold only in the U.S. through iBuypower, so it's fairly unique.

Despite losing to the overclocked (and unstable) OC System in *MusicMatch*, performance was tops. In fact, the Titanium XP ran circles around a 3.06GHz machine we reviewed in January—and for this you can thank the jump from a 533MHz to 800MHz system bus. The 3.06GHz/533MHz machine scored 285 in *SYSmark2002* and took 342 seconds to complete our *Premiere 6.01* test. Compare that with the Titanium XP's 320 *SYSmark2002* score, and 315 seconds to finish *Premiere*. The iBuypower is marred by a few configuration boo-boos, but it offers top performance for little dough.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	Intel 3GHz Pentium 4C
Mobo	Intel D875PBZ (800MHz bus)
RAM	1GB KingstonValueRAM DDR400 (CL3)
I/O ports	Seven USB 2.0, serial, parallel, FireWire, mic, line-in, three analog out, game port
LAN	Intel Pro/1000 Gigabit Ethernet on CSA port
DISPLAY	
Videocard	ATI Radeon 9800 Pro 128MB (325/310MHz)
STORAGE	
Hard drive	120GB Western Digital WD1200JB (8MB cache)
DVD-ROM	16x DVD-ROM
AUDIO	
Soundcard	Sound Blaster Audigy OEM
Speakers	Klipsch GMX D-5.1
FINE DETAILS	
Case	RaidCom 8-bay
Fans/extras	Two 80mm, case window, cold cathode light, six-in-one media reader, front-mounted temperature gauge
Mouse	Microsoft Intellimouse Explorer 3.0A USB
Keyboard	Mitsuko PS/2
BUNDLE	
Windows XP Professional	
BOOT: 53 sec	**DOWN: 12 sec**



Our zero-point system includes: an Intel D850MV motherboard, a 2GHz P4 CPU, 512MB PC800 RDRAM, a GeForce4 Ti 4600 videocard, and a Western Digital 1000BB hard drive (2MB cache).

MAXIMUMPC VERDICT

TITANIUM XP

IBUYPOWER

+ SILVER DOLLARS

The 800MHz system bus offers significant performance dividends, and the system is reasonably priced.

– SILVER MUCOUS

There's got to be a better way to close off a disconnected USB port. We also would have gone with a different hard drive and speakers.

www.ibuypower.com

$2,395 ($2,195 w/o speakers)

9

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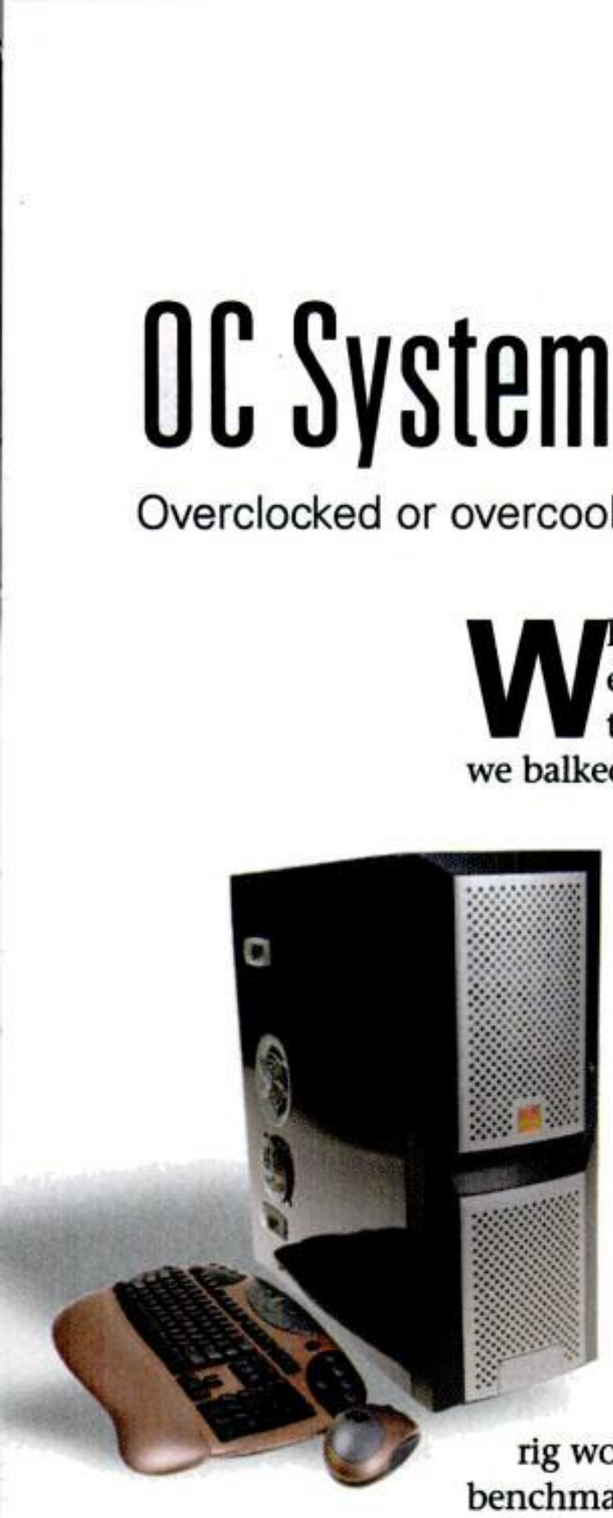
OC System Orion Behemoth

Overclocked or overcooked?



When OC System said it wanted to ship us a review system overclocked to 3.6GHz, we balked. After all, overclocking a single 3.06GHz Pentium 4 to 3.6GHz is possible if you have a generous processor with lots of headroom, but repeating this feat for hundreds, maybe thousands, of CPUs is unlikely at best.

But then the guys at OC System balked at our balking. They said an overclock in excess of 500MHz wouldn't be a problem, and that their rig would run our normal system benchmarks and pass any additional stability tests we might throw its way. Keep in mind, the company was asking us to rate and review a configuration it would sell to consumers.

Thus the gauntlet was tossed, and OC System sent us one of the most audacious rigs we've ever tested. The machine features a 3.06GHz P4 overclocked to 3.58GHz with the help of a very loud Tornado fan clipped to a Swiftech MCX-4000 heatsink. In the graphics department, an ATI Radeon 97 Pro is bolstered from 325/310MHz (core/DDR) to 405/344MHz. The videocard boasts a freakishly large heat-pipe cooler as well. An Abit IT-7 MAX motherboard, featuring the Intel 845PE chipset, plays host to the CPU and videocard, and everything is housed in a sexy enclosure that features an intake manifold to vent cool air directly over the CPU.

The rest of the OC System is straightforward. You get an Audigy 2 Platinum, a slot-fed Pioneer DVD-ROM drive, a 52x CD burner, and a 120GB Western Digital drive with an 8MB buffer. Subtract the crazy overclocked CPU and videocard, and you have the standard fare.

Though there are two 120mm fans (one in the rear, one in the front), and two 80mm fans that can be manually controlled with a Vantec baybus, we could never tell if the auxiliary fans were on or off—the Tornado CPU fan was so freaking loud, it eclipsed all other sounds.

Benchmarks? We expected to see a clash of the titans between OC System and iBuypower; the former running a 3.6GHz P4 and 625MHz bus, and the latter running a 3GHz P4 and 800MHz bus. Unfortunately, OC System didn't show up to the fight. We thought we would need to run repeated stress-tests to prove that the OC System was capable of running without incident for long periods of time, but it took only our normal benchmark suite to prove that the rig was a ticking time bomb. It couldn't run our simple Adobe *Premiere 6.01* benchmark, and it required multiple *SYSmark2002* runs to even record a final result. And sadly, despite the videocard's huge heat pipe, the rig never made it through a single run of *3DMark2001 SE*. We also saw serious visual artifacts before the rig would force the benchmark to crash to the desktop.

Although well outfitted, the Behemoth is crippled by instability.

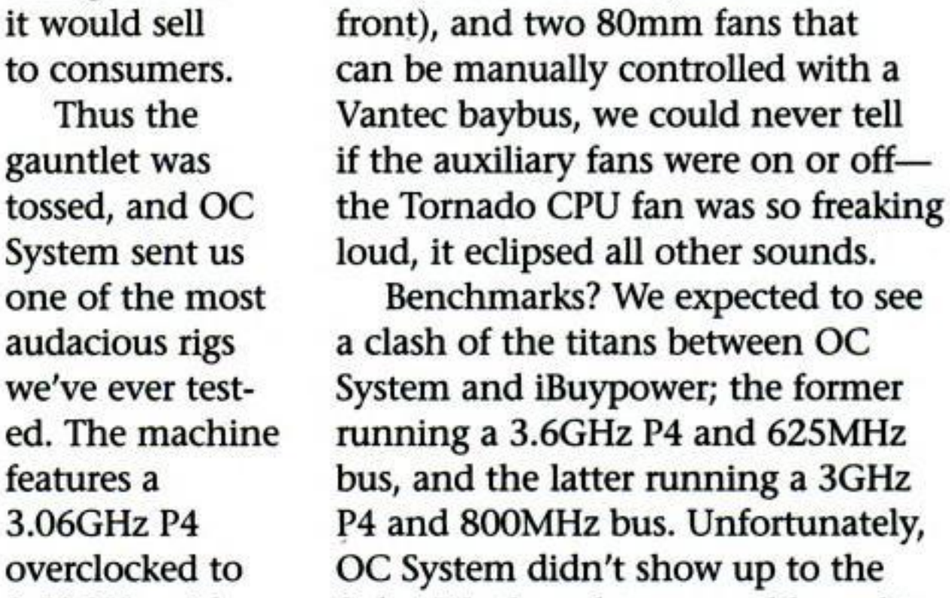
Against our better judgment, we did try one stress test (simultaneously running the CPU-intensive *SETI@Home* and *Folding At Home*), and were promptly greeted with a spontaneous reboot. Repeated attempts at client multitasking failed, and neither client would execute for more than 30 seconds when run alone. Keep in mind, we weren't asking the OC System to do much. We simultaneously ran both clients on the iBuypower machine over a weekend without a hitch.

OC System guarantees stability and offers full warranties on its OC'd components. Nonetheless, it's clear that the machine we reviewed was pushed *way* past redline. We didn't even have to ding the box for its unconnected front USB port—the rig's overall instability is reason enough to stay away.

—GORDON MAH UNG

UNDER THE HOOD

THE BRAINS	
CPU	3.58GHz Intel Pentium 4B (overclocked from 3.06GHz)
Mobo	Abit IT7-MAX (Intel 845PE chipset)
RAM	512MB Geil PC3500 (DDR400+)
I/O ports	Seven USB 2.0 ports, three FireWire, VGA, TV-out, DVI, mic, line-in, three analog out, PS/2 mouse, PS/2 keyboard
LAN	Intel Pro/1000 MT Gigabit Ethernet
DISPLAY	
Videocard	OCS Enhanced Radeon 9700 Pro 128MB (405/355MHz)
STORAGE	
Hard drive	120GB Western Digital WD1200JB (8MB cache)
DVD-ROM	Pioneer DVD-106 16x DVD-ROM
CD-RW	CD-RW 52x24x
AUDIO	
Soundcard	Sound Blaster Audigy 2 Platinum
Speakers	Klipsch ProMedia 5.1
FINE DETAILS	
Case	OSC Diamond Warp 10 Bay
Fans/extras	Two 120mm, two 80mm, north bridge fan, Vantec VAN-520 520 watt power supply
Mouse	Logitech Cordless Mouseman Optical
Keyboard	Logitech Cordless
BUNDLE	
Windows XP Professional, Ahead Nero Burning ROM	
BOOT: 46 sec	**DOWN: 8 sec**



Our zero-point system includes: an Intel D850MV motherboard, a 2GHz P4 CPU, 512MB PC800 RDRAM, a GeForce4 Ti 4600 videocard, and a Western Digital 1000BB hard drive (2MB cache).

MAXIMUM PC VERDICT

Orion Behemoth
OC SYSTEM

+ DENNIS HOPPER
The case offers massive cooling options, and is unique in a sea of Antec/Chieftec clones.

– CRISPEN GLOVER
One of the most unstable machines we've ever been asked to officially review.

www. ocsystem.com
$2,842
4

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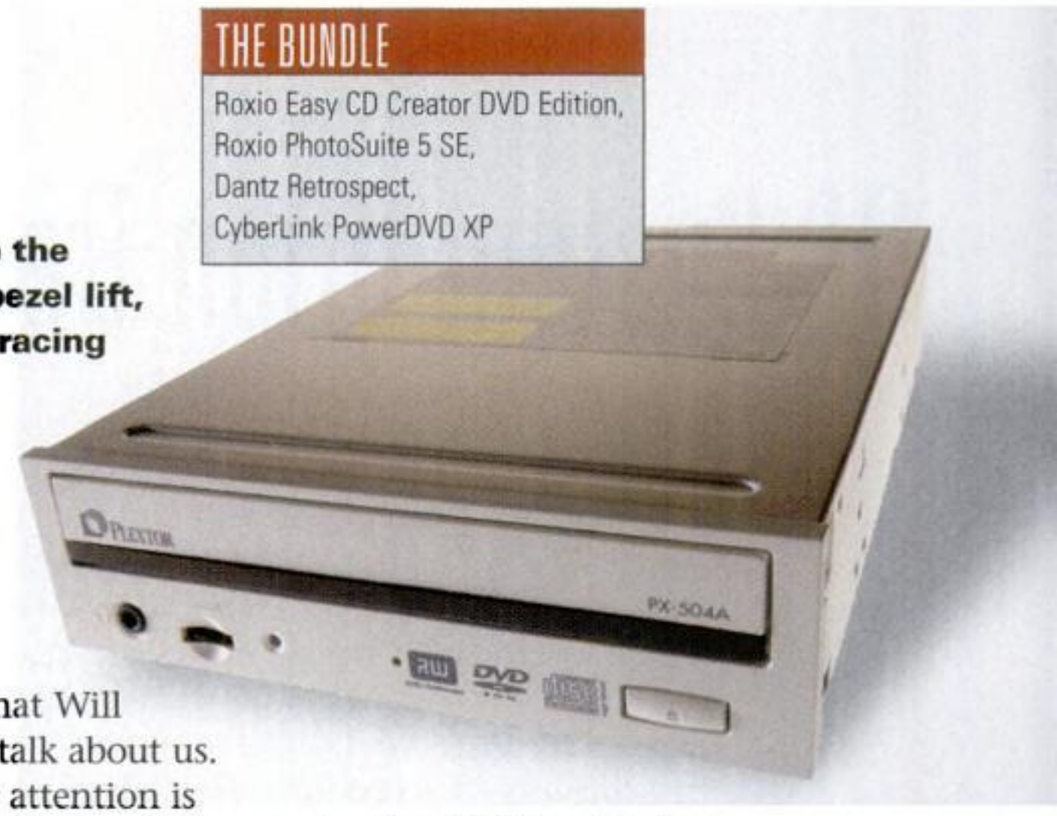
Plextor DVD+R/W DVD and CD Burner

Quality doesn't require a fancy name

THE BUNDLE

Roxio Easy CD Creator DVD Edition,
Roxio PhotoSuite 5 SE,
Dantz Retrospect,
CyberLink PowerDVD XP



Plextor gave the PX-504A a bezel lift, with a slick racing stripe to distinguish it from Plextor CD burners.

Will Rogers once said, "Let advertisers spend the same amount of money improving their product that they do on advertising, and they wouldn't have to advertise it." OK, that was back in the 1920s, way before everyone had televisions and there was such a thing as a "branding firm." Times have changed a bit since then. But that quote comes to mind when we observe Plextor's first recordable DVD drive, blandly called the PX-504A. Not the PlexWriter, the Plex-O, or the Burn Queen. Just a model number.

Yes, we have a point—we think if Will Rogers were making a DVD of his rope tricks, he'd probably use the PX-504A. He'd appreciate the attention to detail that Plextor provides, such as the black disc tray that tests show reduces the number of disc read errors by enhancing reflectivity. Or the nearly silent operation of the drive, even when burning at its highest speeds. And we know Mr. Rogers would love that Plextor continues to bring down DVD seek times to record lows, even though that might not be the sexiest thing to brag about on the box. In fact, at 112ms for random access and 185ms for full-stroke access, these are the lowest seek times we've seen from any DVD reader. (Random access tells us the average time it takes to hit random points on the disc. Full-stroke access measures how long it takes the drive to skip from the beginning to the end of the disc.)

THE PX-504A REPERTOIRE

Writes to:	DVD+R	4x
	CD-R	16x
Rewrites to:	DVD+RW	2.4x
	CD-RW	10x
Reads:	DVD-ROM	12x
	CD-ROM	40x

But enough about what Will Rogers would like. Let's talk about us. One sure way to get our attention is to break a record, which Plextor did once again by writing 4.25GB to a DVD+R at 4x in 13:14 (min:sec). That's nearly a half-minute faster than the closest competitor. Likewise, when writing to DVD+RW, the rewriteable format, the drive came in at an unprecedented 24:03.

If ripping audio is your thing, you'll be glad to know that the PX-504A is no slouch, ripping 70 minutes-plus of perfect audio in 3:23—impressive for a CD burner, and even more so for a combo drive. Plextor did stumble a bit with CD-R speeds, which are restricted to 16x. Why, oh why? A time of 5:29 to burn a 700MB CD isn't a tragedy, but Sony gave us 24x in its dual-format DRU-500A.

Speaking of dual formats, the PX-504A supports only DVD+R/W. For most people, this won't be a huge problem. We maintain that DVD-RW has the compatibility edge over DVD+RW, but the write-once formats are nearly indistinguishable in terms of compatibility with set-top players. As the +R/W format seems to have the most commercial appeal, why not have the best of both worlds in a single drive?

Roxio's *Easy CD Creator DVD Edition* is bundled for all your optical tasks, including authoring DVD Video with the embedded *DVD Builder*. Functionally, it's similar to *MyDVD 4.0*. It supports direct-to-DVD video capture (importing analog signals will require a video capture card), simple video editing with trim and split capabilities, motion backgrounds (with sound), and automatically generated looping video menu buttons. But *Easy CD Creator DVD Edition* still falls short of *MyDVD 4.0*. It was extremely picky about the video files it chose to accept, giving free passes to AVIs, but rejecting MPEGs with just a vague error message that told us nothing about what was wrong with the files. You can't edit text directly on the DVD menu. Instead, a dialog box pops up—a classic first-generation software blunder that we should never see anymore. But the most ghastly issue is with the video encoder, which operates at merely twice the speed of real time. Argh! For a two-hour video, that leaves you plenty of time for lunch.

Even though we personally feel that Roxio's *DVD Builder* ought to be taken out in the back and given the Goodfella's treatment, it's an adequate package for making simple DVD Video discs. The inclusion of Dantz' *Retrospect Backup 6* is welcome, however, as other manufacturers have chosen not to bundle backup software with DVD recorders, or have bundled limited versions and nagware.

The flimsy DVD authoring software and lack of dual-format capability rob the otherwise worthy PX-504A of its Kick Ass award. Nonetheless, its DVD writing and access speeds are the fastest we've ever tested. And Plextor's lack of branding savvy is strangely comforting to us. The company has built a solid reputation the old-fashioned way—by making reliable, well-engineered products.

—LOGAN DECKER

BENCHMARKS	DVD	CD
Average data transfer (MB/sec)	9.7	4.5
Random/full-stroke seek (ms)	112/185	109/184
Audio extraction (min:sec)	-	3:23
Data DVD/CD burn (min:sec)	13:22	5:35
CPU utilization	13% (2x)	6% (8x)

The data CD burn test uses the bundled applications to create a 700MB CD-R. The data DVD burn test uses the bundled applications to create a 4.25GB. The audio extraction test uses a commercially stamped 70:07 minute audio CD. All tests were performed using Verbatim media, except where noted.

MAXIMUMPC VERDICT

PX-504A
PLEXTOR

+ X-RAY VISION
Yet another benchmark-crushing winner comes out of the Plextor stables.

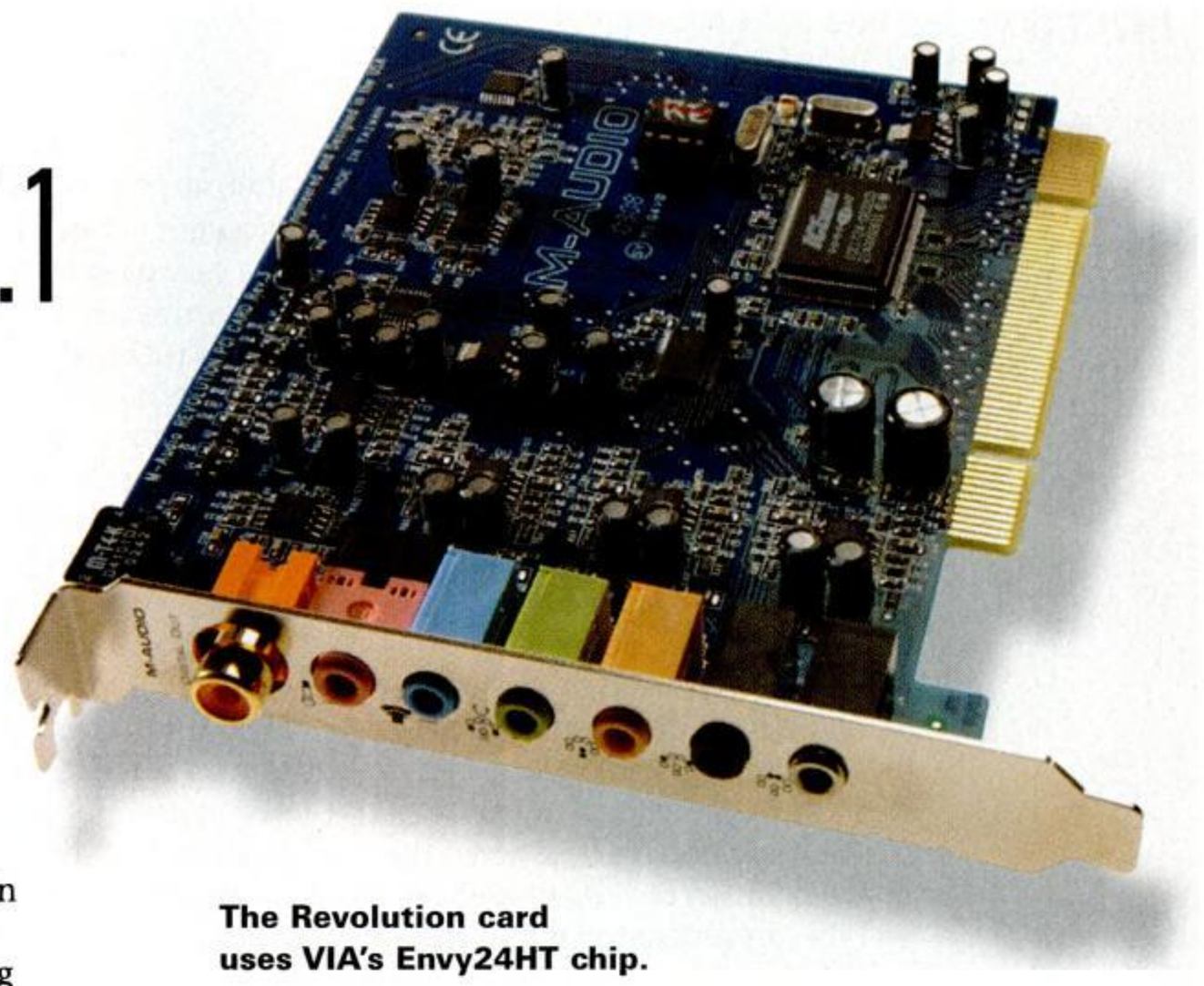
– MACROVISION
But it's hobbled by so-so software and the CD burning speeds of yore.

www.plextor.com
$300
9

Copyrighted material

M-Audio Revolution 7.1

Beautiful sound, bothersome frame rates



The Revolution card uses VIA's Envy24HT chip.

Ever since *Maximum PC's* been in business, the best soundcards have offered hardware acceleration—using onboard DSPs (digital signal processors), the good ones handle audio processing chores natively in order to keep CPU utilization to a minimum. But as CPU speeds have climbed to 3GHz and beyond, there's been a move afoot to throw more processing chores in the direction of under-taxed CPUs. Thus we have M-Audio's Revolution 7.1, a sweet-sounding, 24-bit soundcard designed for host-based processing.

Shunning a powerful (and expensive) DSP, the Revolution in many ways acts as a simple conduit to get audio from your games and applications to your audio-out jacks. Make no mistake, its 24-bit converters and codecs sound *huge*, but the card itself is bereft of internal audio connectors and looks like it's been stripped down and left on blocks. There are four analog-out ports (that support 7.1 analog speakers), as well as an RCA SPDIF-out, a line-in, and a mic input. But that's pretty much it. There are no FireWire, optical, or even game port jacks.

At first glance, you'd think this sucker was a $25 bottom feeder, but the Revolution is a true 24/192kHz soundcard capable of recording at up to 24-bit/96kHz—something the original Creative Labs Audigy can't even do. The Revolution also supports recording at 24-bit/96kHz with ASIO drivers—something the Audigy 2 will do only in the pricey Audigy 2 Platinum EX bundle. During subjective listening tests of games and 16-bit/44kHz music, some of us thought the Revolution 7.1 offered better audio rendering than the Audigy 2, while others called a tie, and still others stuck by Creative's mainstay.

With 24-bit/96kHz material though, we think the Revolution 7.1 actually sounds distinctly better than the Audigy 2. But we must note that the Audigy 2's ability to play even higher-resolution DVD Audio (24-bit/192kHz) gives it a leg up on the Revolution in the high-high end.

As for offloading chores to the CPU, one school of thought says your CPU should be left alone to handle game physics, AI, and other tasks that enrich the gaming experience. But the new way of thinking says a 3GHz CPU can actually offer a hell of a lot more audio processing oomph than even the most badass DSP and still have enough juice for other tasks. To test the Revolution 7.1, we used a 3.06GHz Pentium 4B in an Intel D850EMV2 motherboard with 512MB of PC1066 RDRAM and a Radeon 9700 Pro. We then ran both an Audigy 2 and Revolution 7.1 through *Quake III Arena*, *Comanche 4*, *Unreal Tournament 2003*, and the new *3DMark2003* audio benchmark to see if there was a discernable frame rate drop in performance.

The outcome? We found the Revolution 7.1 to lag far behind the Audigy 2. Could've been the drivers. Could've been who knows what. But real-world testing showed frame rate hits. In *3DMark2003* with 24 sounds enabled, the Audigy 2 yielded 47fps, while the Revolution spit up just 35fps—a 24 percent hit. We're not sure if *3DMark2003* is the perfect benchmark, though, as the test oddly showed the Audigy 2 to be faster than the Revolution when audio was completely disabled.

The Revolution fared no better in our other tests. In *Quake III* and *Comanche*, it was nearly 10 percent slower, and in *Unreal Tournament 2003*, the card produced frame rates that were between 15 percent and 24 percent slower when hardware acceleration was turned on. (Also, we must note that none of the other tests showed the Audigy 2 to be faster with audio disabled.)

On one hand, we have the first soundcard to sound as good as—or possibly better than—the Audigy 2. But all this comes with a frame rate penalty. Are you ready to trade 67fps for 52fps? Maybe, maybe not. But how will the Revolution fare with tomorrow's games? If your CPU finds itself gasping for air under *Doom III*, what happens when it also has to churn through audio duties?

The Revolution 7.1's gaming performance obviously won't win over gamers, but PC musicians and all-around audiophiles should certainly give it a listen.

—GORDON MAH UNG

THE BUNDLE

Tony Hawk Pro Skater 3, MixMan Studio, VJ Lite, WinDVD 4 Dolby Digital EX version. Both Macintosh and Windows driver support.

MAXIMUMPC VERDICT

REVOLUTION 7.1
M-AUDIO

+ REVOLUTION

Excellent fidelity, good bundle, and the first 24-bit alternative to the Audigy and Audigy 2.

– REVOLUTION #9

Reliance on host-based processing drags down frame rates. Control panel options are scant.

www.m-audio.com
$99

8

Copyrighted material

Budget 3D Fistfight

Two cards battle to unseat the Ti 4200

Despite a strong challenge from ATI's Radeon 9500 Pro, the undisputed leader in the $200 videocard space has been nVidia's GeForce4 Ti 4200. But now ATI's Radeon 9600 Pro and nVidia's GeForce FX 5600 Ultra—represented here by the Gainward Ultra/760 XP—want to claim that distinction.

The main difference between the new generation of $200 powerhouses and the last generation is that the new cards include support for DirectX 9 pixel and vertex shaders, and should be powerful enough to play next-gen games like *Doom III* and *Half-Life 2*.

—WILL SMITH

The FX Powerback Ultra/760 XP Golden Sample: Red and dead.

Gainward FX Powerpack Ultra/760 XP Golden Sample

The dubiously named Gainward Golden Sample comes equipped with 128MB of 128-bit DDR memory, and a 0.13-micron GeForce FX 5600 Ultra core, both running on 350MHz clocks. The Gainward also features S-video-in and S-video-out, which you can use to capture video from an analog source and view your PC content on a TV, respectively. (S-video-to-composite adapters are included as well.)

The two qualities that set the Ti 4200 apart from its competition were excellent out-of-the-box performance, and easy overclockability. Unfortunately, the new 5600-based Gainward board doesn't have the same great out-of-the-box speed—at least with respect to the fastest videocards currently available. It's significantly slower than nVidia's 5800 series boards, because it runs at reduced clock speeds *and* has just four pipelines. That said, even with half the pipelines of the 5800 Ultra, the new 5600 is still faster than the GeForce4 Ti 4600 class of boards, which were world record frame rate busters just a year ago.

Now, as far as matching the 4200's overclocking headroom, we were able to crank up the Ultra/760 XP to a 390MHz core and 420MHz memory clock by enabling the Coolbits overclocking feature integrated into nVidia drivers. That's an increase of 40MHz and 70MHz, respectively. Of course, the Radeon 9600 Pro overclocked significantly more.

We tested a stock-clocked Ultra/760 XP in our 3GHz Pentium 4 test bed with 4x antialiasing and 8x anisotropic filtering turned both on and off. Comparative benchmarking against the ATI 9600 Pro was humiliating for the Ultra/760 XP, except in *Quake III*, where the nVidia-based card eked out a 0.1fps lead.

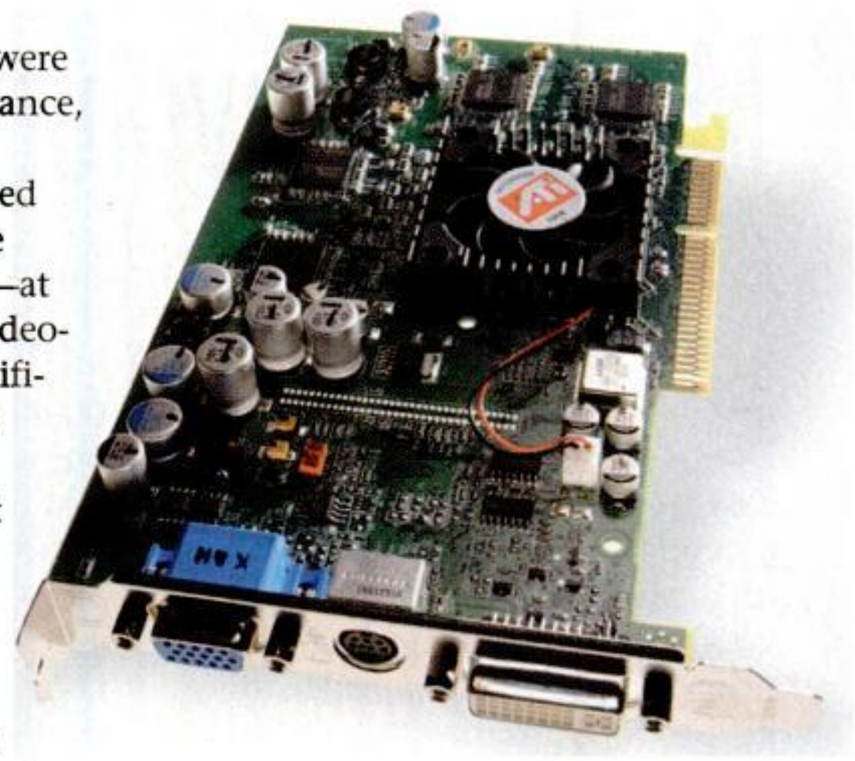
V8 SPLASH: Video-in/video-out is always welcome.

GRASS MINT JELLY DRINK: The board isn't as fast as its $200 competitor, and doesn't overclock as well either.

MAXIMUM PC VERDICT: 7

$200, www.gainward.com

The 9600 Pro: Green and mean.



ATI Radeon 9600 Pro

The Radeon 9600 Pro is based on ATI's RV350, a heavily modified version of the R300 core used by the Radeon 9800 Pro. The GPU is clocked at 400MHz, while the 128MB of DDR memory rides a 128-bit pipe, and is clocked at 300MHz. The card doesn't include any fancy video-inputs, but it does feature an S-video output.

At its default clock speeds, the Radeon 9600 offers better performance than the GeForce FX 5600 Ultra, but is no threat to the 9800 Pro. Even though the 9600 Pro's core is clocked 20MHz faster than the 9800's core, its memory is 30MHz slower, and the 9600 has half the pipelines, which is what really hampers its performance, relatively speaking.

Nonetheless, this card has major overclocking potential. Even though we couldn't get *PowerStrip* to recognize the new core (the chip wasn't publicly available when we received the test board), we did find a utility called *RadLinker* that let us overclock the 9600 Pro, and we were able to push the core an extra 150MHz! The memory didn't have as much headroom, but we got it running at 350MHz without any visual artifacts at all. If you add an aftermarket cooler and maybe even some memory heatsinks, you might be able to take your 9600 Pro even farther.

Unlike previous midrange cards from ATI and nVidia, the 9600 isn't a crippled version of a faster core. Hardware hackers eventually found a way to enable the four disabled pipelines in the Radeon 9500 (which uses the same R300 core as the 9700), but we fear that there may not be an additional four pipelines waiting to be enabled in the RV350, because it was designed specifically for midrange cards and laptops. We'll keep you posted.

DR. PEPPER: Fast, overclocks like a madman, and costs significantly less than a kidney.

MR. PIBB: At its stock speeds, it's nowhere near as fast as the top-shelf 9800 Pro.

MAXIMUM PC VERDICT: 8

$200, www.ati.com

DARE TO COMPARE: GAINWARD VS. ATI

	GAINWARD 5600 ULTRA		ATI RADEON 9600 PRO	
	no AA/aniso	4x AA/8x aniso	no AA/aniso	4x AA/8x aniso
3DMark 2003 Overall	2497	1246	**3283**	**1523**
3DMark 2003 Game 2	12.2	5.8	**20**	**7.4**
3DMark 2003 Game 4	12.9	8.4	**19.3**	**12.8**
Quake 3 MPC Demo	**85.6**	31.3	85.5	**43.1**
Serious Sam: TSE - Valley	15.5	12.2	**25.2**	**14.4**
UT2003 Flyby	47.8	16.3	**63.9**	**25.1**
UT2003 Botmatch	32.3	12.3	**48.6**	**18**

Bold indicates best score. All tests were run on our Pentium 4 3.06GHz test beds, which are equipped with 512MB of RDRAM and run Windows XP Professional.

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Acronis True Image 6.0

MAXIMUM PC KICK ASS PRODUCT

Just about the easiest way to improve your image

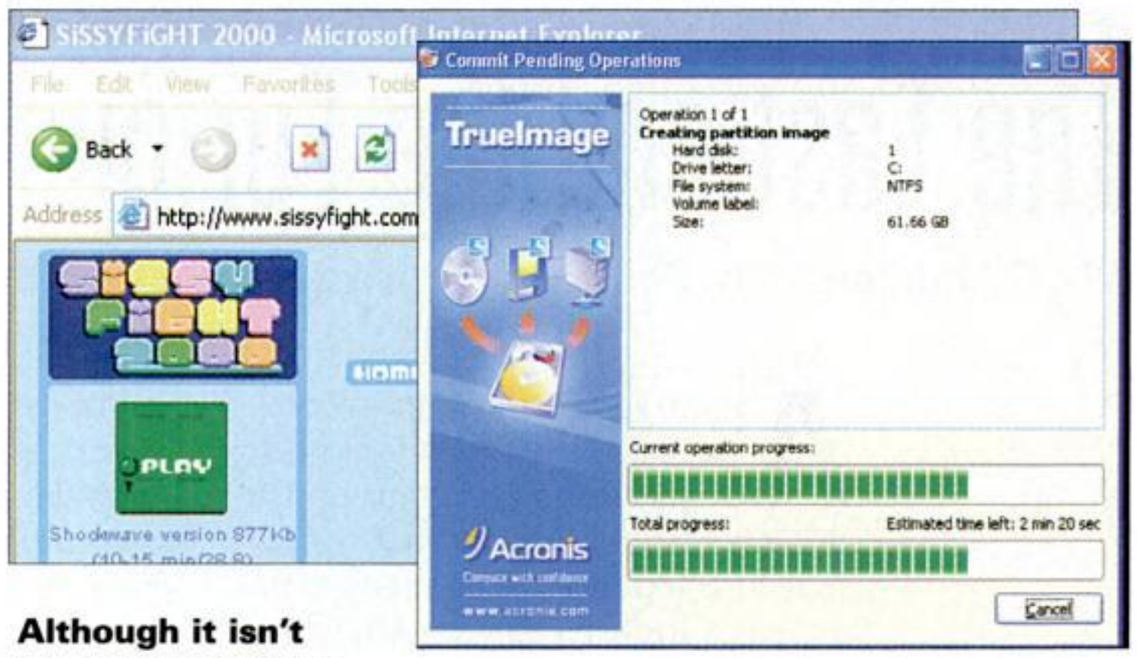
Thanks to programs like Symantec's *Norton Ghost* and PowerQuest's *Drive Image,* the process of backing up the entire contents of a hard drive's partition into a single file is now an easy point-and-click affair. So if these programs work fine, is there really a need for another one that does essentially the same thing? After taking Acronis' *True Image* for a walk around the block, we'd say there is.

What distinguishes *True Image* from its competitors is that the entire imaging process can be performed from within Windows without needing to reboot a single time. You can even restore a partition without rebooting, as long as it's not the one that holds your OS. In fact, restoring the partition that contains your OS is the only job that requires an end-run around Windows.

True Image not only makes the imaging and restore processes easy, but it's also exceedingly comprehensible. The program's wizard-like interface tells you the purpose of each step (such as choosing the compression level). When you click an option, the bottom portion of the screen describes what that particular option will do in clear, jargon-free language.

But what really puts ants in our pants is *True Image* support for external drives, a feature we've been groveling for ever since we started using these utilities. We backed up our WinXP partitions to both USB 2.0 and FireWire drives—*True Image* had no problem accessing and restoring images from these externals. Of course, you can also back up an image to consecutive CD-R/Ws and even recordable DVDs! And you can mount your images as virtual drives in WinXP, which allows you to extract just the files you need, when you need them.

Our sole reservation is the lack of any telephone technical support—it's e-mail or nothing. This is bad news for any backup program. If something goes wrong, how long do you want to wait for an answer?



Although it isn't recommended, we browsed the web while our primary partition was being imaged to another drive. Try *that* with your current imaging program.

Other than that unfortunate policy, we think *True Image* is a big step ahead of its competitors. *True Image* has the simplicity and comfort of baby shampoo, and yet it ought to be in the toolbox of every PC power user.

—LOGAN DECKER

CHELSEA CLINTON NOW: *True Image* addresses the two major failings of other drive-imaging products: poor support for external drives, and the need to reboot at least once or twice.

CHELSEA CLINTON THEN: No tech support by telephone? Not even some ex-con with a princess phone and the manual?

MAXIMUM PC VERDICT: 9

$50 ($45 downloadable), www.acronis.com

The Fast and the Furious

52x CD burners from Sony and Samsung compete at the speed limit

The handsome Samsung 52x should be admired briefly, then buried quietly in a shoebox somewhere in the backyard.

About 160 revolutions every second. That's how fast a disc is spinning when your optical drive is reading at 52x. That figure may also represent how many times a second industry fat cats are worrying about how to continue selling optical drives.

Sure, it's likely that one or two thrill-seeking companies will bust out with 56x drives. But we're looking at the waning days of speed advancements in recordable CD technology. If you want to make a splash with a CD burner these days, it had better use every trick in the book to squeeze out every ounce of performance. Or else, why bother?

Although we'd love to create an atmosphere of white-knuckled suspense, it's probably best to get this out of the way from the get-go: Both Sony and Samsung get a harsh caning from *Maximum PC* this month. 52x burners are for 52x intense geeks, and neither drive, for different reasons, lives up to the lofty expectations.

—LOGAN DECKER

SONY 52/24/52 CD-R/W

If you've bought or stolen a CD burner in the last year, chances are slim that you'll realize much advantage with a 52x drive. And that's especially true of Sony's new drive, which took 2:49 (min:sec) to burn a 700MB CD using the bundled *B's Recorder*— far from a Lab record. CD-RW burning didn't fare any better. In fact, 5:03 is the slowest time we've ever recorded for 24x rewriting. Read times, on the other hand, were well ahead of the Samsung. Similar to Plextor's PlexWriter, the default read speed for the Sony 52x is 40x. So, in order to read a disc at 52x, you have to press and hold the eject button for five seconds. The drive LED blinks, and only then will the drive's speed be uncapped. The problem is, you have to do this *every time* you insert a disc—and you have to wait until the disc spins up and is recognized by the drive before you can do it. That could amount to many seconds of waiting to install some games. Couldn't Sony have defaulted to a less punishing 48x?

Digital audio extraction should have been faster than 2:35, though that number isn't exactly unimpressive. The only pleasant surprise was the above-average seek times, although they're still slower than the best PlexWriter's. It's too bad, because this drive needs at least one feature that makes it stand out. Instead, it's a rather bland package unsuited to the refined palates of power users.

DISCS OF TRON: There's something to be said for a drive that installed and operated without any hassles at all. Snappy seek times.

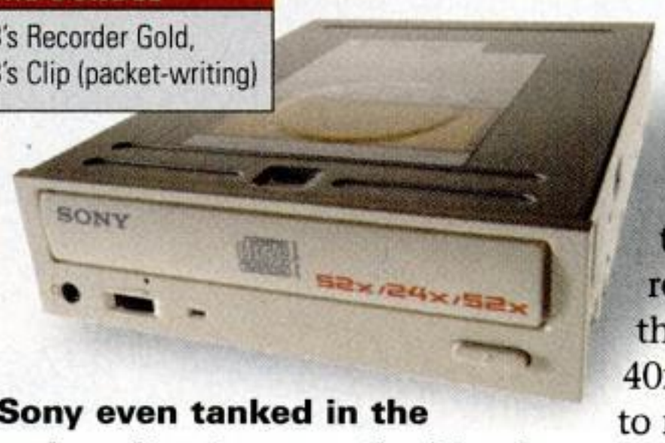
HERNIATED DISCS: Read and write times sit behind the curve. And that's not what anybody wants in a 52x drive.

MAXIMUM PC VERDICT: 7

$90, www.sony.com

THE BUNDLE

B's Recorder Gold,
B's Clip (packet-writing)



Sony even tanked in the swimsuit category—the bland bezel and goofy red-lettered font aren't going to look particularly appealing in a cool aluminum case.

SAMSUNG 52/24/52 CD-R/W

The super-quiet, benchmark-busting Samsung SM-332 combo drive that we reviewed in October 2002 had us doing a happy little jig in the Lab. Unfortunately, we didn't feel the urge to break out the fiddles and bagpipes for Samsung's SW-252B 52x CD burner.

OK, the numbers: 2:32 to burn 700MB. Not bad at all, though the Asus 52x (reviewed in February 2003) still pulls ahead at 2:17. Things took a sharp turn for the worse when burning to rewriteable CDs. It took 4:42 to burn 647MB (the current record is held by the PlexWriter at 3:47). But the worst aspect of the drive was that we were unable to coax the SW-252B into reading our discs above 40x, thus resulting in an average data transfer rate of a mere 31.7x (compared with the Sony's 39.1x). We tried using different media, and stamped media instead of burned media—the results were always the same. Because you'll probably benefit more from speedier application and game installs than you will from CD burning, this is a fatal flaw.

That's a drag, because the drive's digital audio extraction is above average at 2:14, and it includes a generous 8MB buffer. (The drive has buffer-underrun protection, of course, but each time that kicks in, you add a significant amount of time to the disc burning process.) The noise generated by the drive was similar to that of the Sony—something akin to a mouse-size blow-dryer at its highest speed. The SW-252B could have used the noise-dampening technology of Samsung's spectacular SM-332 DVD/CD combo drive. But even complete silence wouldn't make up for the lame read speeds. If you're looking for a 52x burner, walk right on by the SW-252B, and don't look back.

DISCUS: A fat 8MB buffer could reduce the reliance on buffer-underrun protection on older machines.

DIPTHERIA: Plodding read speeds rarely exceeded 40x.

MAXIMUM PC VERDICT: 5

$80, www.samsung.com

BENCHMARKS

Average data transfer (MB/sec)	5.7
Average drive rating	39.1x
Random/full-stroke seek (ms)	90/140
Audio extraction (min:sec)	2:35
Data CD burn (min:sec)	2:49
CPU utilization (at 8x)	7%

BENCHMARKS

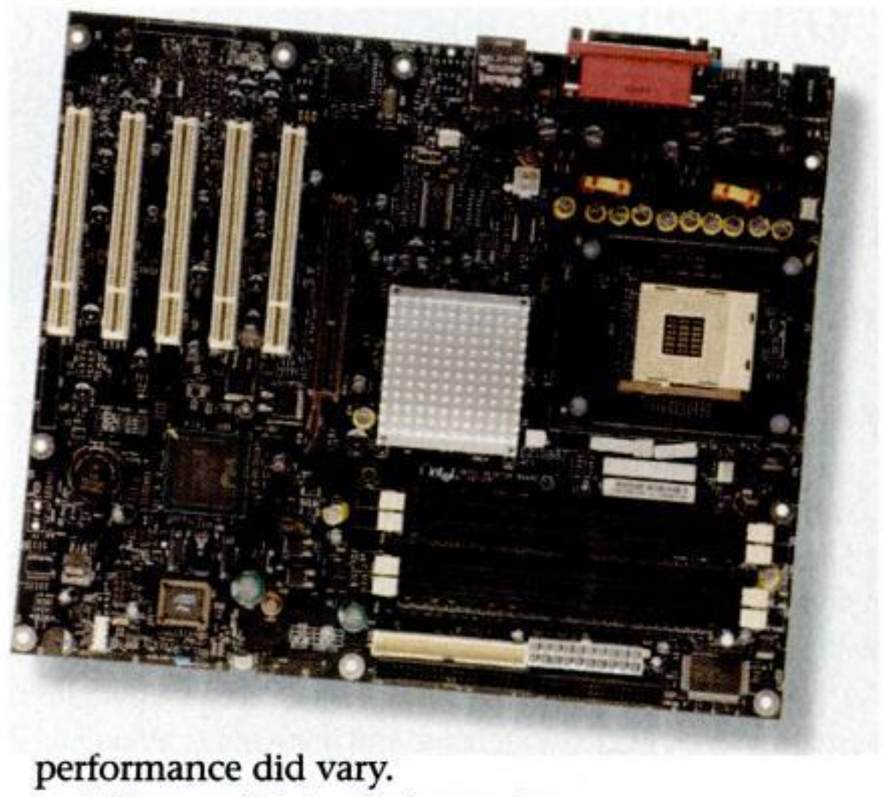
Average data transfer (MB/sec)	4.6
Average drive rating	31.1x
Random/full-stroke seek (ms)	94/161
Audio extraction (min:sec)	2:14
Data CD burn (min:sec)	2:32
CPU utilization (at 8x)	6%

The audio extraction test uses a commercially stamped 70:07 minute audio CD. The data-CD burn test uses the bundled applications to create a 700MB CD-R. All tests were performed using Verbatim media, except where indicated.

Copyrighted material

Intel D875PBZ

Intel's new board is a bonanza of features



Intel's Bonanza even lets you overclock!

Let's just blurt 'em out right now: Ben Cartwright, Little Joe, Hoss, and the ever reliable Hop Sing.

OK, with all the obligatory references out of the way, we can get down to the business of telling you why Intel's new D875PBZ—code-named "Bonanza"—is the best Intel motherboard we've ever tested.

Built on the new 875P chipset, the board introduces Intel's move to dual-channel DDR400 RAM, and also showcases a host of new goodies, including an 800MHz system bus, 8x AGP, native Serial ATA support, and a special port that hooks gigabit Ethernet directly to the northbridge. The Bonanza board also features the ICH5R southbridge, which adds soft RAID Serial ATA to the equation as well.

This review isn't just about the Bonanza, though. It's also our first hands-on look at the 875P chipset and a chance to see how it stacks up against the other dual-channel chipset contenders. To test its mettle, we pitted the 875P against the RDRAM-loving 850E (sitting on an Intel D850EMV2 motherboard); the DDR266 E7205 (sitting on a Gigabyte 8INXP); and SiS's hot new DDR-crazy 655 (sitting on a Gigabyte SINXP1394). We tested all four boards using common components and drivers (save respective RAM types).

In *Quake III Arena*, a major memory bandwidth hog, we saw the Bonanza/875P combo rip the other chippies to shreds. The same dominance was displayed in SiSoft *Sandra* (as expected). The Bonanza was the fastest of the four in all our tests, but not always by as much as one would expect. In *SYSmark2002*, it just squeaked past the dual-channel DDR333 Gigabyte board, but we must note that the Gigabyte board came slightly overclocked right out of the box, so comparisons are slightly skewed (see benchmark chart for details).

Outfitted to appeal to the moderate tweaker, Intel has included a "burn-in" mode that's really just an overclocking switch. Sure, the feature offers just a 5 percent overclock, and the switch doesn't let you juice up your voltage, but that protects nut cases from frying their CPUs, and maybe that's for the best.

One interesting feature of the Bonanza's ICH5R southbridge is its RAID implementation. You can build a Serial ATA RAID array without having to install the OS. It's a sweet trick, but the process is still a little clumsy. Also noteworthy are the mobo's healthy number of fan headers (four) and multiple temperature sensors. There are also six USB 2.0 ports, and each has a separate channel in the southbridge. The layout of the board is particularly clean, though there is one poorly placed capacitor near the first PCI slot. Access to the RAM is easy, and doesn't require removing the AGP card. The board supports as much as 4GB of RAM across four DIMM slots. Intel says the board and its drivers are designed to accommodate the varying qualities of available DDR RAM, so compatibility problems should be infrequent. We have to concur, as the board functioned well with different types of RAM, though performance did vary.

When switching between two sets of Corsair DDR400 and a pair of Kingmax DDR400 modules, we saw performance vary by several percentage points. The variance also occurred when using a pair of Kingston ValueRAM modules. The best performance came from two Corsair modules we had in the Lab. And of course, like the nForce2, 850E, and E7205 chipsets, the 875P requires that you populate two channels for full performance. You'll definitely need the fastest RAM you can get in order to wring the most performance from this motherboard.

While Intel bragged that 875P could be implemented on relatively inexpensive four-layer motherboards (something no one would have thought possible with single-channel DDR just three years ago), the Bonanza is a six-layer design. We suspect that the decision to go with six layers is purely for stability purposes. Intel motherboards are known for their rugged reliability, and Intel probably didn't want to jeopardize its flagship motherboard and chipset by cutting corners.

Is this board for the overclocker intent on phase-change or water-cooling? No. It's for people who want the fastest stock performance possible, the absolute pinnacle of extra features, and the rock-solid Intel name.

—GORDON MAH UNG

DARE TO COMPARE

Chipset	Intel 875P	Intel 850E	Intel E7205	SiS 655
Motherboard	Intel D875PBZ	Intel D850EMV2	Gigabyte 8INXP	Gigabyte SINXP1394
CPU	3GHz P4C	3.06GHz P4B	3.06GHz P4B	3.11GHz P4B
Bus speed	800MHz	533MHz	533MHz	540MHz
RAM type	Dual Channel DDR400	Dual Channel PC1066 RDRAM	Dual Channel DDR266	Dual Channel DDR333
Quake III Arena	**407 fps**	361 fps	358 fps	364 fps
SYSmark2002 Overall	**315**	301	296	313
SiSoft Sandra 2003 RAM	**4911**	3354MB/s	3312MB/s	3436MB/s
SiSoft Sandra 2003 RAM	**4945**	3347MB/s	3311MB/s	3445MB/s
3DMark2001 SE	**16596**	15504	15276	15663
3DMark2003	**4870**	4778	4761	4829

Bold denotes best score. Test components included a 120GB Western Digital WD1200JB, PC Power and Cooling Silencer 400, Pioneer DVD-106, ATI Radeon 9700 Pro, Catalyst 3.1 drivers. The theme to Bonanza has lyrics and was written Ray Evans and Jay Livingston.

MAXIMUM PC VERDICT

D875PBZ
INTEL

+ CATTLE RANCHERS
No-nonsense motherboard with enough features to keep you happy, plus performance galore.

– SHEEP RANCHERS
A little pricey, and not quite the tuning board for the all-out overclocker.

www.intel.com
$175
9

Copyrighted material

Nomus 3G

Nomus equals "no mouse"

The Nomus fits snugly against the bottom edge of a traditional keyboard, and eliminates the need for a mouse.

You can imagine our surprise and skepticism when we first unpacked the Sun-Flex Nomus, which was pitched to us as a mouse alternative. Its footprint alone elicited gasps of horror. Where are we supposed to put *that*?, we wondered, looking askance at our cluttered work areas. But, you know, after spending just a short time with the sizable bugger, we began to appreciate its unique qualities.

Like many a Scandinavian company these days, the Swedish firm Sun-Flex concerns itself with ergonomics, and the Nomus embodies that mindset. It was designed to eliminate the physical discomfort that's often associated with repetitive and prolonged use of a mouse or trackball. For one thing, the buttons, cursor control, and scroll function sit at the front and center of your work space, allowing easy ambidextrous operation, so no one hand bears the brunt of your computer usage. Furthermore, all that area surrounding the buttons makes for 24/7 wrist support, so to speak. And to put things in perspective: While the Nomus may take up unprecedented space in front of your keyboard, you in turn gain all the space that was previously reserved for mouse maneuvering.

Getting accustomed to the Nomus was surprisingly easy, and a huge relief since it shipped with scant instructions. A visit to the web site (**www.sun-flex.com**) clued us into the theoretical benefits of the product, and the design itself borrows enough from traditional mice to make adoption of the unit fairly intuitive. There's a set of right- and left-click buttons for either hand; a single button for "scrolling" (which in fact functions with a straightforward click rather than a turning motion); and a rubbery bar in proximity to your thumbs that rolls forward and back and slides side to side for cursor control. As you might predict, the Nomus is not ideal for gaming.

All in all, using the Nomus with a standard keyboard for non-gaming chores was not only comfortable, but kind of fun. However, using the Nomus with an *ergonomic* keyboard, is awkward and impractical—an irony we simply can't ignore.

—KATHERINE STEVENSON

SWEDISH FISH: Easy to use, and good for you.
LUTEFISK: Incompatible with ergo keyboards, unsuitable for gaming.

MAXIMUM PC VERDICT: 6

$180, www.sun-flex.com

Neuros HD 20GB MP3 Player

Big player, big ideas, little satisfaction

The enormous Neuros HD MP3 player might be easily mistaken for one of those fancy stud finders you get at Home Depot.

Neuros calls the Neuros HD 20GB a "digital audio computer." Most of us would call it an MP3 player, but at more than five inches long and almost an inch and a half in depth, maybe the marketing folk figured the category deserved a name upgrade. The unit consists of two parts that fit together—a piece that houses the controls and display, and a hefty brick of an attachment that contains the 20GB hard drive.

The design of the Neuros HD remains a mystery to us. The modular "backpack" approach makes sense only if you expect to upgrade the unit in the future. But how many people are going to feel so restricted by the unit's current capacity that they'll be willing to chuck the 20GB backpack into the garbage and purchase a new 40GB attachment? And get a load of this: The Neuros HD connects through USB 1.1 only. *Shameful.*

We didn't have any beef with the sound, although track-switching did seem to take longer than with Apple's iPod or Creative Labs' Zen. The software isn't worth going on about—suffice it to say, it's yet another weird "do it our way" interface. You can drag and drop files directly onto the Neuros through Windows Explorer, but for storage only—none of your music files will play on the unit if you merely drag and drop.

Where Neuros really went wild is with the features. MyFi, for instance, refers to the built-in FM transmitter that broadcasts your music to an FM radio at close range. It doesn't work reliably beyond a couple feet away from the radio, and wasn't nearly as good as the irock FM Transmitter ($30, **www.myirock.com**) at locking onto a frequency in a moving vehicle. Unless your music is already indistinguishable from static, you will probably be gravely disappointed by this feature.

The FM tuner worked well, and is augmented with a feature that Neuros calls HiSi, which records a portion of a broadcast song at the push of a button. The next time you connect the player to your PC, the sample is compared with an internal database and Neuros names that tune. It's a feature that's helpful primarily in the purview of mainstream radio.

The Neuros HD is full of great ideas that just aren't well executed. There's a drawing board on this month's magazine cover. We recommend the developers go back to it.

—LOGAN DECKER

MARS: The modular design is a great concept, and we appreciate the extra helping of features.
SARS: Great concepts need great execution. The Neuros HD 20GB didn't get it.

MAXIMUM PC VERDICT: 6

$400, www.neurousaudio.com

CAVEAT EMPTOR

Neuros also offers a 128MB solid-state player that can be upgraded by purchasing the 20GB backpack, but you cannot buy the 20GB backpack and use the embedded unit as a solid-state player. The dual function is only possible by starting with the 128MB model and buying the 20GB backpack separately.

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Hewlett-Packard iPaq 5450

The no-compromises Pocket PC

We can only assume that when the HP engineers were spec'ing out the iPaq 5450, they checked off every PDA option currently available. Onboard Bluetooth radio? Got it. Wi-Fi? Yes. SDIO? Yuppers. Beautiful transflective screen? You bet. Expansion sleeves to use either full-size or dual-PC Cards? Yep. The latest PXA250 CPU? Check that off too. Biometric fingerprint reader? Yes!

MAXIMUM PC KICK ASS PRODUCT

And, amazingly, while the iPaq 5450 is a tad heavy at 7.2 ounces—a full ounce heavier than the Toshiba e740 and about 1.5 ounces heavier than Palm's Tungsten T—it's actually not that much larger (formfactor-wise) than the e740 or the extended Tungsten T. And the iPaq 5450 trumps both its competitors' onboard capabilities with a tour de force of features.

When you turn on the iPaq, the differences among the three PDAs become most apparent. The 5450's transflective display, with its backlighting and reflective mode, puts the front-lit e740 and Tungsten T to shame. Sitting next to the iPaq, the other two just look pale and dim. Oddly, the iPaq display doesn't fare as well outdoors. The Toshiba's front-lit screen looks far better under direct sunlight, but don't let this dissuade you, because 90 percent of the time you'll be using a PDA indoors.

Like the Toshiba e740, the iPaq 5450 also adds a graphics accelerator to the mix. The graphics chip isn't from a recognizable company like ATI. Instead, HP uses MediaQ's MQ-1100 chip, which features a 64-bit 2D engine and 256K of SRAM. For what it's worth, there was no discernable difference in graphics performance between the e740 and iPaq.

In terms of Wi-Fi performance, we found that the Toshiba e740 was far more sensitive than the iPaq 5450. In many areas, the Toshiba hovered in the 90 to 100 percent signal range, while the iPaq was down in the 60 percent range. It's possible the iPaq didn't like our wireless access points, but it's more likely that the iPaq's may need some work in the Wi-Fi department.

The latest iPaq, however, certainly feels more rugged than the competition. With its integrated plastic shell (which features a nifty clear cover that swings out of the way), the PDA has a decidedly solid feel. We were also surprised by how well the biometric fingerprint reader worked. Because users are putting more and more sensitive information on their PDAs, HP wanted an easy way for people to secure their devices without having to remember and punch in a cumbersome password. You can opt to secure the unit by fingerprint only, or default to traditional password-protection should you lose a finger in a horrible case-modding accident. The truly paranoid can use both security methods in tandem, whilst they dodge international spies, men in black, and other shadowy characters that induce suspicion.

Next to the 5450, other PDA displays pale in comparison —literally.

HP's new iPaq is the most feature-packed PDA we've ever tested, and considering the steep $700 list price, it should be. (Plus, in addition to all the Pocket PC apps, you get Universal Electronics *Nevo* remote control software, a back-up utility, and *Bust'em*, a nice *Breakout* clone.) The PDA really gives you just about everything except an onboard Compact Flash reader, and that can be added through an expansion pack. The 5450 is no lightweight, but it is the king.

— GORDON MAH UNG

The 5450 may weigh a bit more, but it doesn't take up much more space than its competitors. (Left to right: Tungston T, 5450, e740)

THE SPECS

CPU	400MHz Intel Xscale PXA250
Graphics	MediaQ's MQ-1100 with 256K RAM
RAM	64MB/48MB Flash ROM
Weight	7.1 ounces
Expansion	SDIO, Expansion sleeves

MAXIMUM PC VERDICT

iPaq 5450
HEWLETT PACKARD

CARL
Sturdy construction, beautiful transflective screen, and includes just about every option imaginable.

LENNY
A bit hefty, and definitely expensive.

www.hp.com
$700

9

Copyrighted material

Freelancer

Redefining space combat (joystick not included)

Don't be fooled by that mouse interface. Combat can get intense.

Take a six-year development cycle, make numerous design changes, and then watch your creative talent depart. The result is typically a bomb. Yet for all the reviews emphasizing *Freelancer's* troubled production cycle and design changes, the result remains remarkably true to *Wing Commander*–creator Chris Roberts' original intent. *Freelancer* is one of the first truly fresh takes on space combat in eons.

Space sim purists who turn their noses up at a flight system that completely eschews joystick controls have only themselves to blame for missing the best space combat of the season. Although many of the particulars of *Freelancer* have certainly changed since 1999, the game has stayed true to Roberts' original goal of reinventing sim control with a mouse-only interface. Skeptics who were reasonably concerned this would result in little more than a rail shooter like *Rebel Assault* can rest assured that nothing could be further from the truth.

Instead, *Freelancer* lays a staggeringly rich, almost unbelievably vast universe at your feet and lets you explore it at will in a variety of spacecraft. These craft are seen from behind, and flexible mouse control allows you to either click the screen to choose a direction to fly, or (for more nuanced control) to steer with the mouse. Targeting and firing is also done with mouse clicks, with the entire interface forming a seamless, eminently playable, and wholly unique control scheme.

Yet what keeps *Freelancer* consistently engrossing is gameplay that allows you to effortlessly pass from an evolving storyline to free-ranging gameplay and back again, carving out your own role in trade, bounty hunting, combat, and privateering while exploring a very effective narrative at your leisure. The cycle of landing on a planet or base, choosing a mission, completing it, collecting credits, and upgrading your ship is kept fresh by the complexities of the universe and the diversity of missions.

Those predicting disaster for *Freelancer* will be disappointed. It's a remarkably addictive, deep game that will appeal to newbs and space jocks alike.

ARCTURUS: A large, fully-realized universe. Smooth, effective interface.

BETA ANTARES IV: Not a true "sim," and thus not as complex as something like *Independence War.*

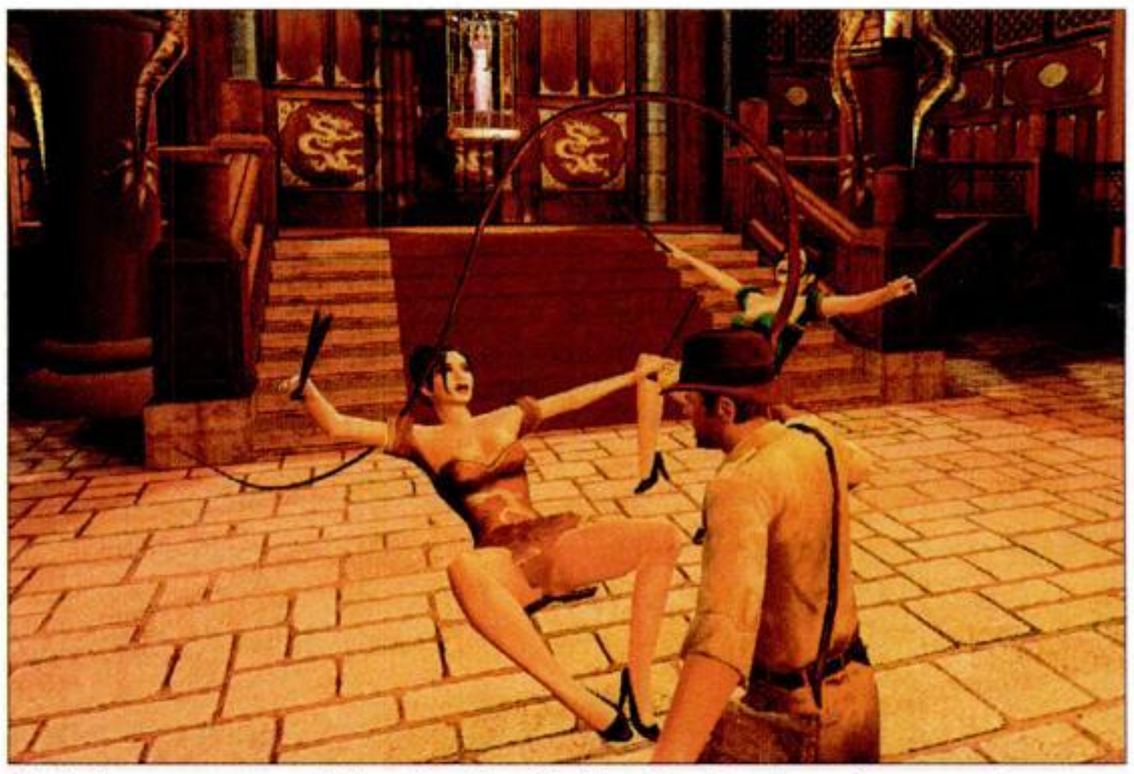
—THOMAS L. MCDONALD

MAXIMUM PC VERDICT: 9

$50, www.microsoft.com

Indiana Jones and the Emperor's Tomb

A weapon of crass destruction



Astute gamers will note the Collective's sly reference to Fellini's *8 1/2*.

In the chapter we now know as *The Emperor's Tomb,* it's not just the Indiana Jones series that gets its tomb raided. LucasArts' third-person action-adventure game digs into the coffers of all sorts of games from the past, including *Tomb Raider, House of the Dead,* and *Buffy the Vampire Slayer* (the superior Xbox game also developed by the Collective). *Tomb Raider* was based in part on the Indiana Jones movies, so maybe it's this recursive thievery that makes the *Emperor's Tomb* seem so old-fashioned.

The most innovative games today—*Grand Theft Auto 3, Splinter Cell*—are moving toward more freedom of play, allowing you to explore, experiment, and decide how to approach each obstacle. *The Emperor's Tomb* goes in the opposite direction, with such severe linearity, you'll find ledges that can't be climbed (despite the fact that they look navigable), simply because that's not where you're intended to go. There are so many damn jumping puzzles, at times we felt more like Wile E. Coyote and less like Dr. Jones. And every time we were impaled, drowned, or karate-chopped, we had to start over at the last checkpoint because there's no damn in-game save!

We could go on and on about the game's faults, including the horrible camera swings, futile swimming sequences, and the tacked-on *Frogger*-esque Trap (Crap) Mode. But then we wouldn't have time to talk about the most enjoyable, Indy-approved part of the game—the fighting. First of all, dump the whip. Although it's useful for attracting attention and occasionally disarming a Nazi, it's not nearly as fun as the brutal combo system. You can play it traditional, with a right-left-right combo, or get creative by kneeing your prey in the gut, grabbing him by the collar of his little Nazi frock, and throwing him over a nearby ledge. If Indy's on a higher ledge than his antagonist, he'll kick him in the face. And if presented with the right opportunity, he's not above a solid punch to the cojones.

Thanks to this crack fighting system and knockout set design, there is an entertaining game underneath all the crap. Like all good archaeologists, you just have to dig for it.

GUTSY MARION: Pulling off a spectacular knockout combo will make you feel young again.

SCREECHY WILLIE: Console busywork and a patented NauseaCam™ make getting to the good stuff a chore.

—LOGAN DECKER

MAXIMUM PC VERDICT: 7

$40, www.lucasarts.com. (Also available from LucasArts: Indiana Jones Boxer Shorts, with a "faux fly for unisex comfort." Well, Indy always did hate snakes.)

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I.G.I. 2

You can call it 'Splinter Suck'

Somewhere between the hyper-realistic *Rainbow Six* games and the cartoon espionage of *No One Lives Forever*, there's a happy medium for stealth shooters. This sweet spot lets you show off your mad FPS skills with realistic guns in a realistic world, but spares you the frustration of constantly dying from one-shot kills.

Enter *I.G.I. 2*, which is set in the current day, and pits a lone operative—you—against baddies in various real-world environments. It all sounds like fun, but the game doesn't provide the subtle clues that are necessary to easily move forward. For example, where *Splinter Cell* would have a maintenance tech working on an air duct that you need to crawl through, *I.G.I. 2* has just a nondescript piece of metal leaning across the duct. Good luck figuring it out!

But the real problem is that *I.G.I. 2* is too short. Instead of adding more content, the developers just ratcheted up the difficulty to ridiculous levels—it took us a couple dozen attempts to successfully complete the second section of the second level! Thankfully, *I.G.I. 2* does include mid-mission saves, although they're crippled by a lame plot device. Instead of saving your game, you're "uploading your data to IGI HQ" and you have only enough battery power to do so three times per level. (Oh well, at least we didn't have to collect any "save gems").

With the exception of excellent stencil shadows, the graphics are sub-par. Low-resolution textures and dozens of cookie cutter buildings detract from the overall experience. When you sneak into the umpteenth identical storage shed with exactly the same crates and shelves inside, you begin to feel like you might not be in the real world.

All this bad mojo is especially disappointing since some parts of the game are extremely fun. Sitting in an alpine meadow and sniping baddies a quarter-mile away is one of the most satisfying gaming moments we've had this year.

Check out the fancy shadows cast by this slaughtered Russian patrol. Unfortunately, this is about the most impressive thing you'll see in the game.

Storming an enemy base and detonating a bridge was a blast, too (no pun intended). Unfortunately, the fun moments are too few, too brief, and too far between to make this game worth playing.

—WILL SMITH

DEATH BLOW: There's a three-round burst setting for the MP5, which is always welcome.

ROCHELLE, ROCHELLE: No amount of three-round bursts could make up for the tedious gameplay.

MAXIMUM PC VERDICT: 5

$40, www.codemasters.com/igi2

Rainbow Six 3: Raven Shield

The prettiest Rainbow of all

One-shot, one-kill: In 1998, it was a pretty radical concept in the comic-book realm of computer action gaming, where superhumans unloaded giant rockets into monsters and healed themselves by running over little Red Cross symbols. *Rainbow Six* changed that, bringing realism, accuracy, and tactical team control to the 3D action arena. Since then, the franchise (and the "tactical shooter" genre it spawned) has flourished, most recently delivering a solo stealth take on the formula (*Splinter Cell*).

But *Raven Shield* marks the start of a new era. The graphics, never a particularly strong point of the *Rainbow Six* series, have reached new heights now that the developers are letting the modern Unreal engine push the polys. As for the developers, well, they're new too. Hot off *Splinter Cell*, Ubi Montreal has taken the reigns from Red Storm without skipping a beat.

Raven Shield is not a reinvention of the series, but a restatement for a new generation. Little has changed in the core *Rainbow Six* design. Missions are still based on the real-world challenges facing special ops teams, with expansive locations filled with plenty of hiding places for well-armed terrorists. Team members are chosen according to their skills in activities such as sniping and demolition, then outfitted from a staggering array of realistic weapons. Though missions are designed to work best as coordinated team efforts, there's a simple "action" option to skip straight to the fight. Each mission has a default plan for people who don't relish messing with the planning screen, which has remained consistently clunky over the years.

AI is as inconsistent as ever, but it provides plenty of challenge, particularly at the highest difficulty level. Terrorists (and even team members) will sometimes forget where the trigger is, frag themselves, or doze off, but it rarely persists. In fact, most everything in *Raven Shield* is quite tight. The game doesn't

The modern Unreal engine allows for more convincing environments and much better use of light than was previously possible.

offer any surprises, but it delivers everything you would expect from a state-of-the-art tac shooter.

—THOMAS L. MCDONALD

SEEING: Classic tactical team-based gameplay. A good selection of multiplayer modes with stable net code. The best-looking game in the series.

BEING SEEN: Piddling storyline. Inconsistent AI.

MAXIMUM PC VERDICT: 9

$50, www.microsoft.com

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$199

Price Reflects $50 Mail in Rebate

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Pinnacle PCTV Deluxe allows you to watch and record your favorite TV shows on your PC, then burn them to disc with your CD or DVD burner.

$189

Hot Sellers

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Socket 478 for Intel® Pentium® 4 with Hyper Threading Technology
Dual Channel DDR memory architecture that supports a maximum memory size up to 4GB
The board, coupled with several of the latest cutting edge technologies such as Serial ATA, Gigabit LAN network, ATA 133 RAID, 6-channel audio, plus the usual fare of features unique only to GIGABYTE, the GA-8INXP will bring users an unlimited level of computing experience.

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- 6 USB 2.0 Ports
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- SoundStorm™ / Dolby® Digital Audio
- Serial ATA Technology
- Dual LAN
- IEEE 1394

$143

Sony DRU510A

Sony's latest Dual RW DVD/CD drive records up to 4.7 GB of data or more than 2 hours of high quality MPEG2 video on a DVD+RW/+R or DVD-RW/-R or disc.

$389

EluminX Illuminated Keyboard

The EluminX™ Illuminated Keyboard has arrived! The keyboard illumination is provided using flat panel ElectroLuminescent technology. Awsome for late night computing!!

$89

ATI Radeon 9800 Pro 128Mb

RADEON™ 9800 PRO graphics technology
128MB of DDR memory and a 256-bit memory interface.
VGA connector for analog CRT
S-video or composite connector for TV / VCR
DVI-I connector for digital CRT or flat panel
Drive two displays simultaneously with independent resolutions and refresh rates

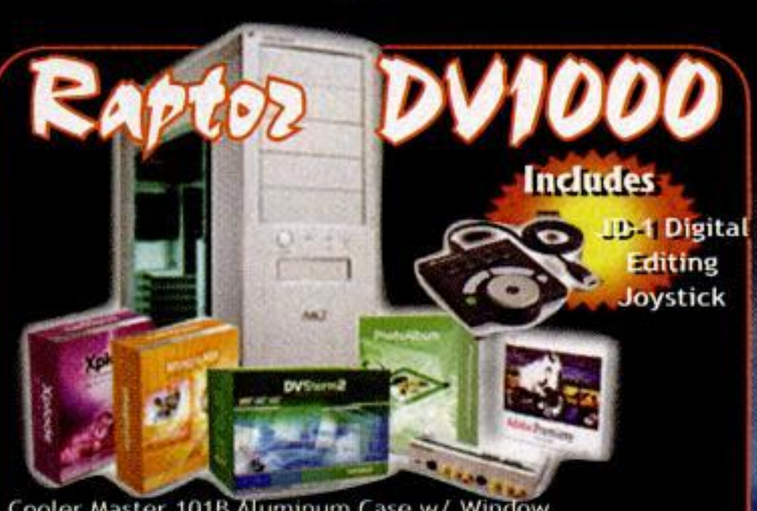
$405

Buzz Special Rock-n-Roll PC

HardDrive.com Case w/ Front USB
300 Watt P4 Ready Power Supply
Matsonic Motherboard w / Video
AMD XP 1800+ 266Mhz FSB
Seagate 40GB ATA/100 Hard Drive
AC97 Digital Audio
512 Mb PC133 Memory
10/100 Ethernet
52x24x48 CDRW Drive
1.44Mb Floppy
17" Monitor
Keyboard, Mouse & Speakers
FREE Lifetime Technical Support

$549

Raptor DV1000



Cooler Master 101B Aluminum Case w/ Window
SuperMicro 400w Dual Xeon Power Supply
SuperMicro X5DAE Dual Xeon 8X AGP, 533MHz, 64bit PCI Mobo
Intel® Pentium® 4 Dual Xeon Processors
3 Ware Escalade 4Port Serial ATA 150MB/sec RAID Card
2 Seagate 120GB Serial ATA 150 Mbytes/sec, Raid 0
ATI Radeon 9700 Pro 128MB Video Card
3GB PC-2100 DDR Memory
Silver Sound Blaster Audigy 2 Platinum w/ Live Drive
Silver Sony DRU500AX DVD-/+R,CDR/RW Drive
Silver Sony 16X/40X DVD Rom Drive
Siver Iomega 750MB Zip Drive, Silver Floppy Drive
Silver Rounded cables, Red Hot Pluggable SATA Cables
Windows XP Professional
Canopus JD-1 Digital Editing Joystick
DVStorm2 Imagination Bundle, Includes DVS2,Storm Bay, Imaginate, Photo Album, Xplode Pro, & Premier 6.5
Built by KickAssGaming PC Certified Technicians
FREE Lifetime Technical Support

$6,761

Intel® Pentium® 4 Xeon 2.0 GHz		$6,761
Intel® Pentium® 4 Xeon 2.2 GHz		$6,783
Intel® Pentium® 4 Xeon 2.4 GHz		$6,791
Intel® Pentium® 4 Xeon 2.6 GHz		$6,935
Intel® Pentium® 4 Xeon 2.8 GHz		$7,299

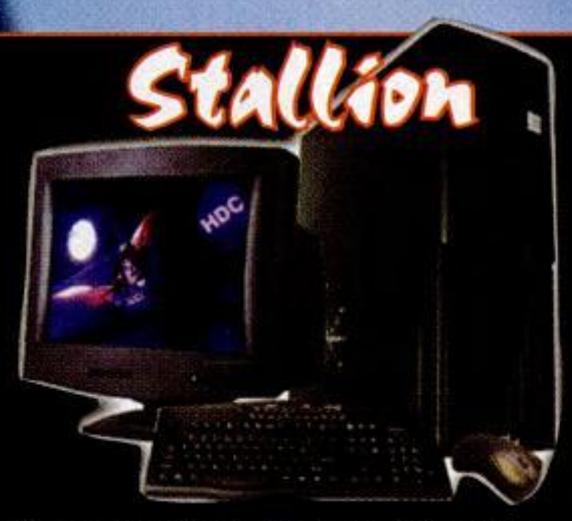
The Pit Bull

HardDrive.com Blue Aluminum Case w/ Window
Antec True Blue 480watt Power Supply
Intel® e7205 Chipset, 533MHz FSB Motherboard
Intel® Pentium® 4 533MHz FSB Processor
2 Seagate 120GB Serial ATA 150 Mbytes/sec, Raid 0
NVIDIA GeForce4 Ti4600 128MB 8x AGP Video Card
512Mb PC-2100 DDR Memory
10/100 Ethernet
Blue Sound Blaster Audigy 2 Platinum w/ Live Drive
Blue 52x24x48 CDRW Drive
Blue 16X/40X DVD Rom Drive
Blue 1.44Mb Floppy
Blue Rounded cables, Red Hot Pluggable SATA Cables
Windows XP Professional
Built by KickAssGaming PC Certified Technicians
FREE Lifetime Technical Support
Logitech Z680 5.1 Sound System
Sold Seperatly - $288

$2,441

Intel® Pentium® 4	2.0 GHz	400Mhz	$2,441
Intel® Pentium® 4	2.4 GHz	533Mhz	$2,449
Intel® Pentium® 4	2.53 GHz	533Mhz	$2,481
Intel® Pentium® 4	2.66 GHz	533Mhz	$2,483
Intel® Pentium® 4	2.8 GHz	533Mhz	$2,563
Intel® Pentium® 4	3.06 GHz	533Mhz	$2,736

Stallion



HardDrive.com Black Hydraulic Case w/ Front USB
300 Watt P4 Ready Power Supply
Matsonic Socket A ATA/100 Audio, LAN, & Video Motherboard
AMD XP 1800+ 266Mhz FSB
Seagate 40GB ATA/100 Hard Drive
AC97 Digital Audio
512 Mb PC133 Memory
10/100 Ethernet
Black 52x24x48 CDRW Drive
Black 16X/40X DVD Rom Drive
Black 1.44Mb Floppy
Black 1280x1024 .24mm CRT Monitor
Black Keyboard and Mouse
Black Speakers
Windows XP Professional
Built by KickAssGaming PC Certified Technicians
FREE Lifetime Technical Support

$839

AMD Athlon 1800+	266Mhz	$839
AMD Athlon 2000+	266Mhz	$859

Enjoy the Sounds of Surround Logitech 4.1 Surround System **$36**

MK3 G1000

Silver SB51G Shuttle PC Case
200 Watt Power Supply
SB51 Small Form Factor 1 PCI, 1AGP
Intel® Pentium® 4 2.4 GHz 533 FSB Processor
512 Mb DDR PC2100 Memory
Seagate 120GB ATA/100 Hard Drive
AC97 5.1 channel Support Digital SPDIF In/Out Audio
ATI Radeon 9700 Pro 128Mb w/TV Out, DVI Video Card
Silver 48x24x48 CDRW 16x DVD Combo Drive
Front USB 2, Line-out/Headphone, MIC, 1394, SPDIF
Back Serial Ports, 1394, USB, LAN 1
Hyper Threading support
Shuttle I.C.E. heat-pipe technology
Windows XP Professional
Built by KickAssGaming PC Certified Technicians
FREE Lifetime Technical Support

$1392

Intel® Pentium® 4	2.4 GHz	533Mhz	$1,392
Intel® Pentium® 4	2.53 GHz	533Mhz	$1,424
Intel® Pentium® 4	2.66 GHz	533Mhz	$1,426
Intel® Pentium® 4	2.8 GHz	533Mhz	$1,506
Intel® Pentium® 4	3.06 GHz	533Mhz	$1,666

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Iomega External

120GB Capacity 7200RPM
USB 2.0 Serial Bus
Includes Drive, USB cord, Interface module, Power cord and quick installation guide.
32394
One Year Warranty

$237

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Our Sales team can guide you into the PC Of Your Dreams
Custom Build A Center Steps 1-9

So You Want Us to Build It?
$25

Windows XP Home Ed. OEM $109

Windows XP Professional Ed. OEM $149

So You Want Us to Load Your OS?
$45

Intel Centrino

Acer TravelMate 803LCi
Pentium M 1.6GHz Centrino
512Mb Memory
60 GB HardDrive
DVD-CDRW
ATI Mobility Radeon 9000
Windows XP Pro
15" SXGA+ Screen
Total Wireless Technology

$2786

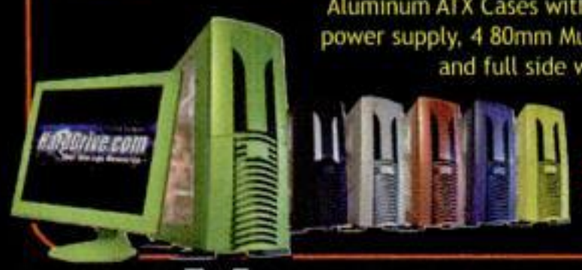
Cases Step 1

Xaser III Case w/ Window V1000D
$179

Matrix 14Bay Full Tower ATX Case MA01GND-S
$99

AOpen ATX Case W/Window & P4 Power Supply H600B
$69

Aluminum ATX Cases with 420watt P4/AMD power supply, 4 80mm Multi Color LED fans, and full side window.



Special $145

Motherboards Step 2

SOCKET 478 (Pentium 4)				
Asus	P4G8X Deluxe	$215	P4S8X DualDDR	$115
	P4B533VLAN	$148	P4T533	$168
	P4T533-C/LAN	$163	P4GEV	$140
	P4PELANVAY	$112	P4PELFWSR	$140
Gigabyte	GA8INXP Dual LAN	$232	GA8PE667	$103
	GA8IHXP2	$168	GA8SG667	$91
	GA5INXP1394	$202	GA8IR533	$85
Iwill	MP4GL	$90	MP4G	$105
	P4ES	$100	P4R533N	$135
	P4G	$102	P4GS	$105
MSI	845EMAX	$85	MS9126010	$196
	GNBMAX-FISR	$233	845GVM-L	$79
Intel	D845PESV	$102	D845GERG2	$105
	D845GVAD2	$156	D50EMVR	$156

Processors Step 3

Celeron 2.1 GHz 128 cache		$90
Celeron 2.2 GHz 128 cache		$93
Celeron 2.3 GHz 128 cache		$102
Celeron 2.4 GHz 128 cache		$118
Xeon	2.0GHz 512 cache	$223
Xeon	2.4GHz 512 cache	$237
Xeon	2.66GHz 512 cache	$312
Xeon	2.8GHz 512 cache	$489
P4	2.4GHz 512k 533	$188
P4	2.4GHz 512k 800	$205
P4	2.53GHz 512k 533	$214
P4	2.66GHz 512k 533	$222
P4	2.66GHz 512k 800	$251
P4	2.8GHz 512k 533	$302
P4	2.8GHz 512k 800	$320
P4	3.0GHz 512k 533	$462
P4	3.0GHz 512k 800	$480

Memory Step 4

SDRAM			
Branded	PC133	512MB 64x64 133MHz	$59
DDR Memory			
Crucial	PC2100	128MB DDR 266MHz	$28
Crucial	PC2100	256MB DDR 266MHz	$67
Crucial	PC2100	512MB DDR 266MHz	$85
Crucial	PC2700	128MB DDR 333MHz	$37
Crucial	PC2700	256MB DDR 333MHz	$59
Crucial	PC2700	512MB DDR 333MHz	$119
Crucial	PC3200	256MB DDR 400MHz	$79
Corsair	PC3200	512MB DDR 400MHz	$120
Kingston	PC3500	256MB Hyper X 434MHz	$110
Kingston	PC3500	512MB Hyper X 434MHz	$210
RDRAM			
All Comp.	PC800	128MB Rambus 800MHz	$50
All Comp.	PC800	256MB Rambus 800MHz	$96
All Comp.	PC800	512MB Rambus 800MHz	$259
Kingston	PC1066	512MB 128X16 1600MHz	$143

HardDrives Step 5

Maxtor	80GB	7200rpm	ATA 133	6Y080L0	$99
Maxtor	120GB	7200rpm	ATA 133	6Y120L0	$135
Maxtor	160GB	7200rpm	ATA 133	6Y160P0	$210
Maxtor	200GB	7200rpm	ATA 133	6Y200PO	$280
Maxtor	250GB	5400rpm	ATA 133	4A250J0	$337
Maxtor	250GB	7200rpm	ATA 133	6Y250PO	$379
Seagate	60GB	7200rpm	ATA 133	ST360015A	$90
Seagate	80GB	7200rpm	ATA 133	ST380011A	$103
Seagate	120GB	7200rpm	ATA 133	ST3120023A	$142
Seagate	80GB	7200rpm	SATA	ST380023AS	$155
Seagate	120GB	7200rpm	SATA	ST3120023AS	$189
Seagate	160GB	7200rpm	SATA	ST3160023AS	$295
WD	40GB	7200rpm	ATA100	WD400BB	$75
WD	80GB	7200rpm	ATA100	WD800JB	$106
WD	120GB	7200rpm	ATA100	WD1200JB	$148
WD	200GB	7200rpm	ATA100	WD2000JB	$274
WD	250GB	7200rpm	ATA100	WD2500JB	$384

Video Cards Step 6

EVGA	064A4N302T4	GEFORCE FX 5200 64MB DDR TV-Out	$88
EVGA	128A8N306T4	GEFORCE FX 5200 128MB DDR TV-Out	$97
EVGA	128A8NV85T3	GEFORCE4 TI4600 128MB 8X AGP	$265
Gainward	ULTRA6508X	GEFORCE4 TI4200 128MB DDR	$195
Gainward	VG4TI42DTF	GEFORCE4 TV/DVI 64MB	$150
Gainward	ULTRA 750-8X XP	GEFORCE4 TI4800 SE 128MB 8XAGP	$220
BFG	ASLM52128	GEFORCE FX 5200 128MB X AGP	$94
BFG	ASLM52128U	GEFORCE FX 5200 Ultra 128MB 8X AGP	$185
BFG	ASLM56256	GEFORCE FX 5600 256MB 8X AGP	$231
MSI	MX440T8X	GEFORCE4 MX440 64MB DDR 8X AGP	$71
MSI	G4TI4200VTD8X	GEFORCE4 TI4200 128MB DDR 8X AGP	$164
MSI	TI4800SETD8X	GEFORCE4 TI4800 128MB DDR 8X AGP	$187
ATI	100434102	Radeon 9500 Pro 128MB TV-Out, DVI	$204
ATI	100434003	Radeon 9700 Pro 128MB 8x TV Out	$359
ATI	100713001	Radeon AIW 9700 Pro 128MB DDR 8x	$405
ATI	100435002	Radeon 9800 Pro 128MB DDR 8x AGP	$419

Sound Cards Step 7

Creative Labs Audigy 2 Platinum is also available in Black, Silver, Blue, Yellow & Green
Audigy 2 Platinum Black Bezel $19

Turtle Beach	Santa Cruz 32-bit	$73
Turtle Beach	Santa Audiotron 100	$272
Creative Labs	Audigy X Gamer	$90
Creative Labs	Audigy MP3	$89
Creative Labs	Audigy 2	$115
Creative Labs	Audigy 2 Platinum	$176
Creative Labs	Audigy 2 Platinum Ex	$229

Creative Labs Sound Blaster Extigy USB External Sound Card With Remote.
$133

CDRW Drives Step 8

			Beige	Color
48x12x48	IDE	Pacific Digital U-30127	$80	$95
48x24x48	IDE	Samsung SW248FRAS	$55	$70
48x24x48	IDE	Plextor PXW4824TA	$102	$117
48x24x48	IDE	Plextor PX320ASW DVD Combo	$145	$160
52x24x48	IDE	TDK AI-5200	$90	$105
52x24x52	IDE	Lite-On LTR5224	$59	$74
52x24x52	IDE	BenQ 5224P	$65	$80
52x24x52	IDE	Pacific Digital U-30146	$80	$95
52x24x52	IDE	Sony CRX220A1	$80	$95
52x24x52	IDE	GoldStar GCE8520	$61	$76
52x24x52	IDE	Teac CDW552	$90	$105
52x24x52	IDE	MSI MS8352	$58	$73
40x12x40	SCSI	Plextor PXW4012TS/SW	$205	$220

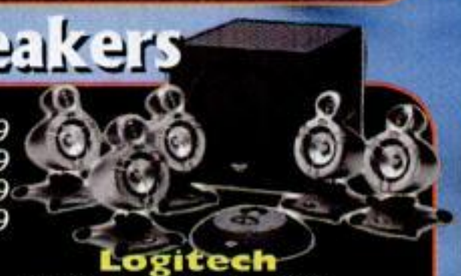
Other Drives Step 9

			Beige	Color
DVD Drives				
16x/48x	IDE	Toshiba SDM1712TA	$48	$63
16x/40x	IDE	Pacific Digital U-30115	$59	$74
16x/40x	IDE	Pioneer DVD Tray DVD120	$49	$64
16x/40x	IDE	BenQ DVD1648A	$50	$65
16x/48x	IDE	Samsung SM348 48x24x48/16x	$80	$95
10x/40x	SCSI	Pioneer DVD305S	$104	$119
CD-ROM Drives				
52x	IDE	Lite-On LTN526	$30	$45
52x	IDE	Creative Labs BLASTER52X	$35	$50
56x	IDE	BenQ CD656A	$29	$44
DVD-RW Drives				
24x10x32	IDE	Sony DVD+R/RW DRU510A	$389	$414
2.5x	IDE	PDC DVD+R/RW CDRW U30134	$280	$310
Floppy Drives				
Mitsumi	IDE	1.44MB D359M3	$13	$17
Sony	IDE	1.44MB MPF920	$13	$21

Removable Drives

USB2.0 Hard Drives				
Buslink	60GB	7200rpm	UII-6072E	$173
Buslink	80GB	7200rpm	UII-8072E	$200
Buslink	100GB	7200rpm	UII-1007E	$222
Iomega	120GB	7200rpm	32394	$237
Maxtor	200GB	7200rpm	S01J250	$398
Maxtor	250GB	5400rpm	S01J250	$399
USB Removable Drives				
Iomega	100MB Zip Ext USB Drive 31714			$78
Iomega	250MB Zip Ext USB Drive 31310			$125
Iomega	750MB Zip Ext USB Drive 32324			$165

Speakers



Klipsch

Klipsch	5.1	6pc	$399
Klipsch	4.2	6pc	$299
GMX D	5.1	5pc	$299
Klipsch	2.1	3pc	$179

Logitech

Z540	4.1	40W	$69
Z640	5.1	51W	$73
Z560	4.1	400W	$144
Z680	5.1	480W	$288

Creative Labs

Inspire5200	6pc	47W	$66
Inspire6600	7pc	120W	$103
Megaworks THX550	6pc	500W	$263

Monitors

CRT Monitors			
Viewsonic	17"	Q71-6 17" 1280x1024 .23mm	$130
Viewsonic	17"	E70B8 17" 1280x1024 .24mm	$138
NEC	17"	FE770M 17" 1280x1024 .21mm	$188
Viewsonic	19"	P90F 19" 1920x1440 .24mm	$292
Samsung	19"	957MB 19" 1920x1440 .20mm	$305
NEC	19"	Diamond Pro 930SB 1920x1440	$329
LCD Monitors			
NEC	15"	LCD1560NXBK Black 1024x768	$338
Samsung	15"	152T Silver 1024x768	$414
Sony	15"	SDM-X52 Gray 1024x768	$403
Viewsonic	15"	VE155B Black 1024x768	$316
Samsung	17"	171SBlack 1280x1024 .26mm	$496
Viewsonic	17"	VE170 Beige 1280x1024	$553
Samsung	21.3"	210T Silver 1600x1200	$1625

Keyboard / Mouse

HDC KeyBoard & Mouse Combo Available in Black,Red, Silver, Blue, Yellow & Green
$35

Logitech Cordless Freedom
$89

Generic 104 Key Keyboard
$9

Mitsuko Black Scroll Mouse
$3

Microsoft Intellimouse Explorer
$49

Logitech MX700 RF Cordless Optical Mouse w/Base
$70

Power Supply

Enermax

Dual Fan P4 Ready	
300 Watt EG301P-VE	$47
350 Watt EG365P-VE	$55
430 Watt EG465P-VE	$84
550 Watt EG651P-VE	$155
Dual Wisper Fan P4 Ready	
350 Watt EG365PVEFC	$59
350 Watt 365PVECA	$75
431 Watt EG465PVEFC	$95
430 Watt EG465VEFCA	$99
Redundent Hot Swappable P4 Ready	
400 Watt ERM2400V	$329
300 Watt EVR3006	$279

Case Mods

Sunon Fans
80mm $13
92mm $17
120mm $21

Window Kits
Rectangle $19
Round $25
Oval $25
L-Shaped $30

80 mm LED Fans
Available in Blue, Green, Red and Tri Colored
$13

We can install any window into a case you buy from us for $35

Neons

Grills
80mm $18
92mm $20
120mm $24

Neon Accents From $24
Blue, Green, Red, Black

Neon Power Adapter $2
standard power connector

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ThorTek Corp. 15355 Blackhawk Friendswood ,Texas 77546 Lifetime FREE technical support.

Prices & Specs subject to change without notice. Shipping charges are non refundable. Returns may be subject to restocking fee. Products are covered by manufacturers warranty only.
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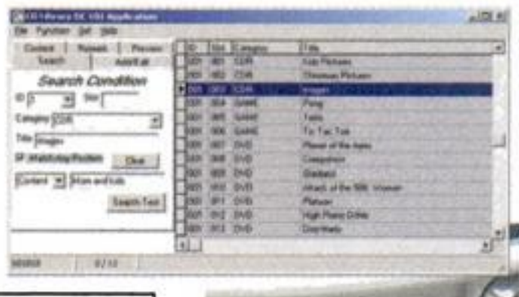
CD Carousel Finds Any Disk in 3½ Seconds!



Can be used standalone or with a PC

Select disks by pushbutton dial, or create a searchable database with the included software and select titles by double-clicking. The carousel rotates and partially ejects disks for easy removal and replacement.

134 1360
was $99.95
ON SALE $89.96

CD Destroyer Makes Disks Unreadable for Total Security

Ideal for security organizations, financial institutions, software developers, government, and all computer users.

With two solid steel knurled rollers, the CD Destroyer permanently destroys both the top and bottom surfaces of CDs, DVDs and other CD-size disks rendering the data-bearing surfaces unreadable. Your sensitive data cannot be read and you don't have to break disks. Operates on both top and bottom surfaces in one pass.

141 0830
was $44.95
ON SALE $40.46

Groovy CD-Rs Look Just Like 45rpm Records

State-of-the-art Azo Blue technology provides superior write performance and broad read compatibility. Combine a cool retro look with the rugged quality and high-performance of today's advanced CD-R technology.

154 0595
was $8.29
ON SALE $7.46

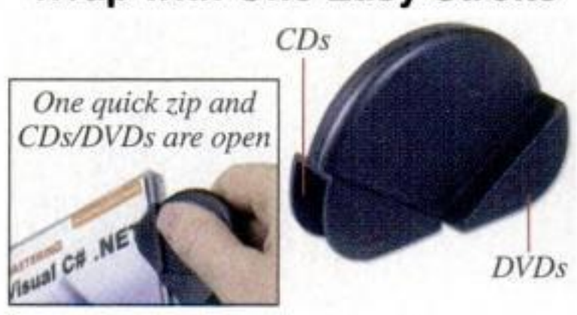
General Purpose 4.7GB DVD-R in Jewel Case

10-pack in clamshell cases

With a capacity of 4.7GB, these disks are compatible with burners that use DVD-R media for general purpose v.2.0. Compatible with data files and some video applications.

154 0612
was $12.90
ON SALE $11.61 10-pack

Zip Open CD/DVD Shrink Wrap with One Easy Stroke



Finally! An easy, simple way to open the factory seal and shrink wrap on CDs & DVDs. A quick swipe with our opener and you're listening to your CDs or watching your DVDs in no time!

113 0675
was $1.59
ON SALE $1.44

Innovative Jewel Cases Hold 1 or 2 Disks on a Single Post

Disks don't touch each other when stored.

Unique post has tiny detents to hold 1 or 2 disks securely in a standard sized jewel case. A tiny space is maintained between the stored disks.

134 0175
was $4.99
ON SALE $4.21

Networking, Case Components, Media, USB Products, Tools, Drives, CPUs, Memory, Cables & More!

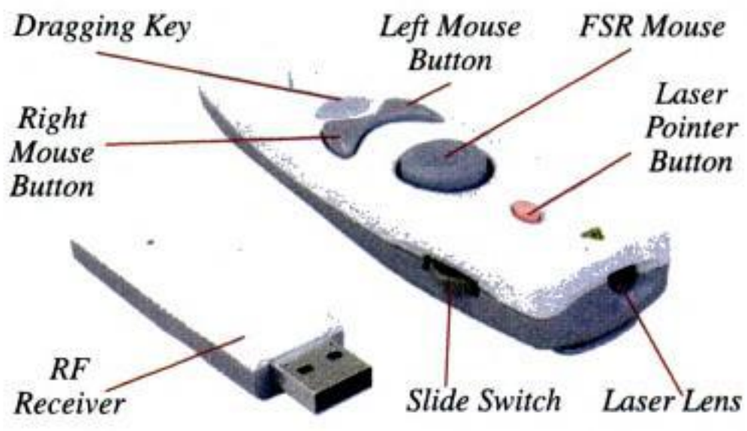
USB 2.0 Hub w/Built-In Cable

Ultra compact and lightweight: 3" x 2" x 7/16"

You remembered your USB hub but forgot the cable? Never again! This tiny Hi-Speed, 4-port hub has a built-in hidden cable.

104 0499
was $19.95
ON SALE $16.96

Wireless RF Scrolling Remote with Laser Pointer



- Conforms to MS serial, PS/2 2-button mouse standard
- Ideal for PowerPoint presentations
- Battery lasts up to one year
- RF range of 33 feet

142 0130
was $59.95
ON SALE $53.96

The Solution to Your Wiring Nightmares!

113 0830

Get your cables organized!

Small Kit: 1 - med., 4 - sml

- Lock and unlock again and again
- Small holds approx. 1" of cables
- Medium holds approx. 2" of cables

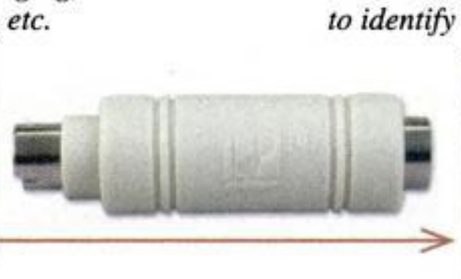
113 0830
was $4.99
ON SALE $4.49

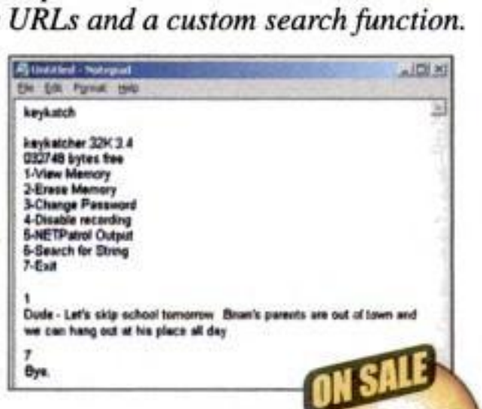
Discreet "Keystroke-Catcher" Records Up to 16 Pages of Typed Text

1 - *Installs in seconds between keyboard and motherboard. No software to install.*

2 - *Captures EVERYTHING typed on your keyboard: E-mail, instant messaging, chat room activity, Web URL's, etc.*

3 - *Records keystrokes to a plain text file viewable on most wordprocessors. Includes NetPatrol™ to identify URLs and a custom search function.*





Protect your children from the ever-present dangers on the internet and monitor unauthorized use of your computer with the KEYKatcher™. KEYKatcher™ installs between your keyboard and motherboard and records every keystroke made on the keyboard. Keystrokes are recorded to memory inside the KEYKatcher™ as a text file viewable with most any wordprocessor. Records approx. 16 typed pages of text.

132 0390
was $49.95
ON SALE $44.96 32K

Low Loss KVM Cable Set

2-pack

Stop video interference with our low loss combination keyboard, video, mouse cables. All-in-one design makes system setup a snap.

129 2260
was $15.95
ON SALE $13.56

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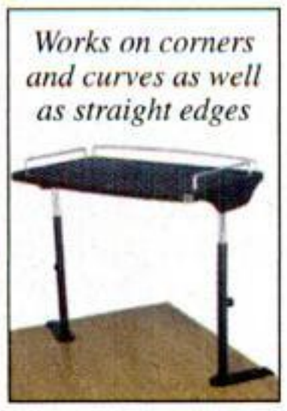
cyberguys.com/mpc06

Sturdy LCD Monitor Shelf Saves Desk Space

Shelf is 20"(W) x 12 1/8"(D)

- Min. dimensions inside are 18"(W) x 14.25"(H)
- Max. inside height is 20.25"

Clamps to tables up to 1 7/8" thick



Works on corners and curves as well as straight edges

Our new monitor shelf attaches directly to your desk creating a sturdy self-contained shelf above your monitor. Molded ABS plastic shelf is very rigid, has metal support posts and hold as much as 26 lbs.

111 0370 was ~~$19.95~~ **ON SALE $16.96**

Transport Your Computer Equipment Like A Pro

Premium Soft-grip handle. 1.5" heavy-duty webbing and hardware

Simply strap our deluxe GearGrip® LT harness around your CPU and take your PC with you! Its an ideal solution for technicians & gamers!

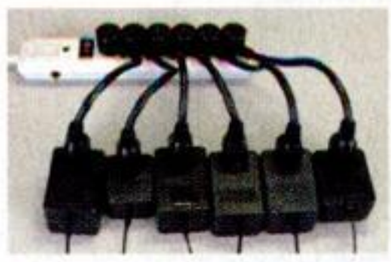
- LT harness is designed to be left on the computer while it is in use
- Triple bar-tacking on the handle and buckle bumpers for strength
- Fits computers up to 60" in circumference and up to 70 lbs.

108 0190 was ~~$16.95~~ **ON SALE $15.26**

Power Strip Liberator Plus!

New pass-through plug doubles your outlets

BEFORE *the Power Strip Liberator you could only use 2 outlets.*



AFTER *the Power Strip Liberator you can use all 6 of your outlets*

An update of a Classic! Get full use of your power strips and UPS outlets with the new Liberator Plus! Simply plug your big, bulky, power adapters into a Liberator and then plug the Liberator into your power strip! No more blocked outlets! Also makes a great short extension cord when you just need a little bit more cable.

121 2510 was ~~$2.39~~ **ON SALE $1.91**

From mouseballs to professional rack products... Cyberguys! has thousands of items to choose from!

Split One 100Base-T Connection Into Two

- 2 adapters required

There's no need to pull cable for another network connection… just plug one of these "Y" splitters into your existing LAN jack, connect a second "Y" splitter to your hub, and you've got another connection!

202 5275 was ~~$10.95~~ **ON SALE $9.31**

This Beautiful Rug Is Actually a Mousepad!

Cleans the mouse as you use it

Tibetan Tiger pattern

7.125" x 10.25"

Made in U.S.A.

Go to cyberguys.com for more styles

Excellent for mechanical and optical mice

The MouseRug® combines traditional handmade rug patterns with the the Lextra® yarn-dyed nylon fiber coating process to create a beautiful little mousepad. MouseRugs® are made by scanning actual hand-woven rugs to look exactly like the original rug.

MouseRugs® are not screenprinted. Tiny yarn-dyed nylon or polyester fibers are fed through a metal screen with an electrical charge which orients the fibers in a vertical position and propels them into the design adhesive. The color can't wear off.

107 0189 was ~~$18.49~~ **ON SALE $16.64**

Mini Multimeter is an Incredible Value

- 3 1/2 digit LCD (max. reading 1999)
- Low battery indicator
- Transistor & diode test

Resistance (ohms): 200/2K/20K/200K/2M
DC current: 200µ/2m/20m/200m/10A
DC voltage: 200m/2/20/200/1000V
AC voltage: 200/750V

115 3750 was ~~$4.99~~ **ON SALE $4.21**

We have 1000's of hard-to-find computer parts and accessories at low prices! Call 1-800-892-1010 or visit us online at cyberguys.com/mpc06 to order your free catalog. *Spend $100 and we'll throw in a cool Cyberguys T-shirt free. Use this free T-shirt keycode:

422-6501

FREE!*

when placing your order.

Ultra Compact USB Flash Drive is Incredibly Tiny!

Win98/98SE/Me/2000/XP (download drivers 98/98SE)

Measures less than 1 3/4" x 3/4" x 1/8" and weighs just 3 grams!

This may be the world's smallest USB Drive, yet it holds 64Mb of data. Just plug it into a USB port and you're ready to transfer data.

245 0670 was ~~$29.19~~ **ON SALE $26.27**

PS/2 to USB Keyboard and Mouse Adapters

131 0840 *Mouse Adapter*

131 0845 *Keyboard Adapter*

Connect a USB keyboard or mouse to the PS/2 ports on your computer with these simple, compact adapters. *Because of PS/2 limitations, these are not interchangeable.*

each was ~~$1.99~~ **ON SALE $1.80**

SVC.com

Silicon Valley Compucycle, 876 The Alameda, San Jose, CA 95126
telephone > 408 292 SVC2 fax > 408 292 5295

Featured Item: UV sensitive clear case for $199.99.

Quad LED Fans

$2.49 and up

These ball bearing fans feature four bright LEDs in a clear housing. SVC has them in 80mm, 92mm, and 120mm sizes. Dual ball bearing 120mm fans are only $6.99. Check our website for color selections. Also available with mixed color LEDs.

Zalman Fan Speed Controller

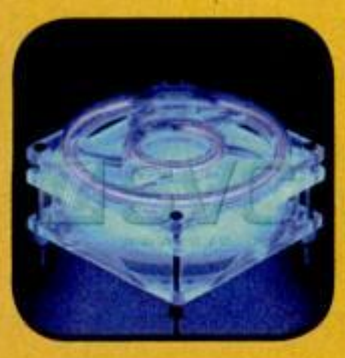
$29.99

Zalman is known for their use of high quality materials for their products. This six channel fan speed controller gives users continuous adjustmen of 5V and 12V fans with LED intensity indicating speed level. A must-have for PC enthusiasts.

3.5" Bay Fan Speed Controller

$17.99

These affordable fan speed controllers conveniently fit into any 3.5" drive bay and adjust fan speeds with a simple turn of a knob. Available in black, silver, and blue with lighted LED halos featured around each speed controller knob.



AngelMod

$9.99

AngelMod is our new line of cold cathode light kits designed to be mounted on 80mm case fans. With two rings of light, AngelMod gives your fan a bright "halo" effect. AngelMod is a quick, easy, and attractive addition to you PC. Give your fan halos!

UV Sensitive Fans

$2.49 and up

A UV sensitive dye is present in these translucent, ball-bearing fans causing them to illuminate neon blue, green, or red under a black light. Available in three colors as pictured and in three different sizes: 80mm, 92mm, and 120mm.

Arctic Cooling CPU Coolers

$12.99 and up

SVC is the exclusive U.S. agent of Arctic Cooling! These affordable and reliable coolers are perfect fo the user who is concerned about noise. Available in four models: Super Silent Pro TC, Copper Silent TC, Slim Silent TC, and Super Silent 4 TC.

UV Sensitive Fans with Quad LEDs

$4.99

Another SVC exclusive product, these fans feature quad ultra-bright UV LEDs inside UV sensitive housing. Generously priced and available in neon blue, green, and red.

LED Acryllic Fans Grilles

$4.99

This new lighted acrylic fan grille features a bright LED that lights up the edges of the laser cut acrylic grille. This SVC exclusive product is available in red, blue, green, blue HDD indicator and multi-color.

Zalman Fanless VGA Cooler

$24.99

The Zalman ZM80A-HP is a new fanless GPU cooler from Zalman that uses a heatpipe, which transfers heat from the front side of the card to the second heatsink on the back side, thus doubling cooling efficiency and eliminating noise.

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Thermalright Copper Heatsinks

$9.99 and up

Thermalright coolers are rated as the best performing heatsinks available. SVC is the number one distributor of Thermalright. SK-6+ $9.99, AX-7 $17.99, SK-7 $19.99, SLK-700 $29.99, SLK-800(A) $34.99, SLK-800(U) $37.99, SLK-900 $44.99.

Flexo Expandable Sleeving

$1.39 for 5 ft.

Expandable sleeving is a great way to organize wires and cables while dressing up the inside of your computer. Get the lowest prices on sleeving, zip ties, and heat shrink tubing. Over 80 colors and sizes including chrome, carbon, and UV reactive.

Arctic Silver Céramique

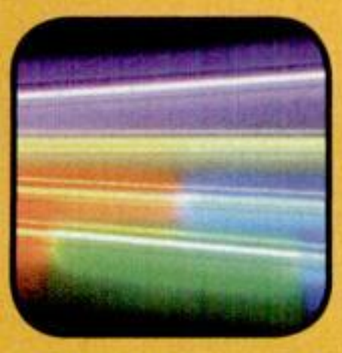
$3.99

This high-density, ceramic-based thermal compound is specifically designed for modern, high-power CPUs and high-performance heatsinks or water-cooling solutions. SVC carries this product in the 2.7g ($3.99) and 22g sizes ($7.99).

Round Drive Cables

$0.99 and up

Available in UV sensitive, braided silver, braided copper, and translucent. 100% shielded cables with ground wires. Floppy cables from $0.99. ATA-133 cables from $1.85. 68-pin SCSI LVD/SE five connector, four device cable for $9.99.



12" Neon Light Kit

$7.99

A price breakthrough at SVC! Available in 12 colors, this dual light capable kit allows you to add another tube for just $3.49. At 29,000 Cd/m^2, these are the brightest lights available. Add sound activation for $5.99.

gBox Blue P4/533 System

$269.99

The AMS gBox Blue P4/533 desktop system with all the capabilities of a normal sized multimedia PC all in a small compact case. Now with Xross Blade Cooling, the system runs cooler and quieter. Please check our website for further specifications.

Laser Etched Grilles

$17.99

These SVC exclusive grilles are laser etched with extreme detail. Each design starts from unique hand drawn artwork before it is laser etched in copper, stainless, or brass. Every grille features an elegant brushed metal finish.

X-Dreamer Case with 350W PSU

$59.99

With room for 8 fans, 11 drive bays, blue backlit front panel, front panel USB and audio, CNC machined acrylic face, and 350W Channel Well Technology power supply, this is one of the best values in high performance computer cases.

Laser Cut Grilles

$0.99 and up

SVC has a wide selection of laser cut grilles featuring unique designs and 3-D construction. Installation of laser cut grilles is quick and easy and affordable way to accent your case. Visit our website for more designs.

CD Storage

$4.99 and up

For all your CD storage needs, SVC offers a wide range of solutions from stackable units to wallet storage types. We also carry the popular one touch cases as seen in Staples and Brookstone. See our many capacities and colors at low prices!

More Accessories

RAM

Original Samsung 512MB PC3200	$81.99
Original Samsung 256MB PC3200	$41.99
Samsung 512MB PC2700	$69.99
Samsung 256MB PC2700	$35.99
Samsung 512MB 1066Mhz RDRAM	$237.99

Hard Drives

Western Digital 600JB 60GB	$76.99
Western Digital 800JB 80GB	$104.99
Western Digital 1200JB 120GB	$144.99
Western Digital 1800JB 180GB	$216.99
Western Digital 2000JB 200GB	$259.99
Western Digital 2500JB 250GB	$372.99

Fans and Fan Accessories

NMB Ultra Quiet 18dB Case Fan	$2.50
SVC Ball Bearing Case Fan	$2.49
Tt Blue Eye HDD Indicator Fan	$6.99
Sunbeam Rheobus speed control	$17.99
12" 3-pin to 3-pin extension	$0.99
3-pin to 4-pin adapter	$0.49
4-pin molex y-adapter	$0.50
80mm Fan Filter	$1.99

Heatsinks/CPU Coolers

SVC GC69 w/Crystal Blue Fan	$7.99
SVC GC68 80mm Socket A Cooler	$4.99
DDR Heatspreader and ramsinks	$3.99
Arctic Cooling Slim Silent TC	$19.99
Arctic Cooling Copper Silent TC	$16.99
Thermaltake SubZero4G Socket 462	$169.99
Thermaltake SubZero4G Socket 478	$169.99
Thermaltake Volcano 9 "Coolmod"	$23.99
Thermaltake Volcano 11	$34.99
Thermaltake G4 "Coolmod"	$17.99
Zalman CNPS 7000 Cu	$43.99
Zalman CNPS 7000 AlCu	$34.99
Zalman ZM-NB32J North Bridge HS	$7.99
Swiftech™ MCX462PLUS™	$49.99
Swiftech™ MCX462U™ Universal	$44.99

Thermal Interface Material

Arctic Silver III 3.0g	$4.99
Arctic Cooling Silver 0.5g	$1.99
Arctic Cooling Copper 0.5g	$1.99
Arctic Cooling Silicon 0.5g	$0.99

Cables

Cat 5 Cable	$0.49
Cat 5 Cable (5 cables total)	$0.99
24" Round Floppy Cable	$0.99
18" Round IDE Cable	$1.85
Serial ATA Cables	$1.99

Cases and Case Accessories

Clear Acrylic Case	$79.99
Thermaltake Xaser III	$159.99
AMS G-Mono "Car Paint"	$59.99
X-Pider Aluminum Case	$119.99
X-Sonic Aluminum Case	$64.99
Akasa PAX Mate	$10.99
350W Raidmax P4 PSU	$9.99
Zalman 300W Noiseless PSU	$59.99
Zalman 400W Noisless PSU	$99.99
Silver case thumbscrews	$0.25
Blue tinted case thrumbscrews	$0.19

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Abit IT7-MAX2 V2 845PE Socket 478	$172.99
Asus A7N8X nForce2 Socket A	$126.99
Asus A7V333-X KT333 Socket A	$86.99
EpoxEP-8RGA nForce2 Socket A	$114.99
EpoxEP-8RDA+nForce2 Socket A	$104.99

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ProMagix™ A/V/D

Intel® Pentium® 4 3.0GHz Processor, 512K Cache
Intel® Certified High Performance Heatsink/Fan
CM110 Case - Full Tower, Solid Aluminum
Intel® D875PBZ - Intel 875 DDR Motherboard
1024MB Corsair™ PC3200-XMS DDR400 Memory
256MB Matrox® Parhelia™ Triple Head Video
RT.X100 Xtreme Digital Video Editing System
36GB WD Raptor 10,000rpm Hard Drive, SATA
Dual 180GB WD 7200rpm, 8MB, Striped Raid Array
Black Pioneer® DVR-05 DVD-RW
Black 1.44MB Floppy Drive
SoundBlaster® Audigy® 5.1 Audio Adapter
10/100/1000MBps Ethernet Network Adapter
Black Microsoft® Multimedia Keyboard
Silver Microsoft® Intellimouse® Explorer Optical
Microsoft® Windows® XP Pro w/SP 1 and CD
Custom Owners binder with complete documentation
3 Years Parts & Lifetime Labor Limited Warranty
1 Year Toll Free 24/7 Support & On-Site Service
Meticulous hand wiring and neatly folded cables

$4795

MissionMax™ A/V/D

AMD® Athlon™ 3000+ XP Processor
AMD® Certified High Performance Heatsink/Fan
VX Yellow Case - Full Tower with front USB 2.0
Asus® A7N8X-D nVidia® nForce2™ Motherboard
512MB Corsair™ PC3200-XMS DDR400 Memory
128MB Matrox® Parhelia™ Triple Head Video
RT.X10 Xtra Digital Vedeo Editing System
80GB WD 7200rpm Hard Drive, 8MB Cache
Dual 80GB WD 7200rpm, 8MB, Striped Raid Array
Black Pioneer® DVR-05 DVD-RW
Black 1.44MB Floppy Drive
SoundBlaster® Live 5.1 Audio Adapter
10/100MBps Ethernet Network Adapter
Black Microsoft® Multimedia Keyboard
Silver Microsoft® Intellimouse® Explorer Optical
Microsoft® Windows® XP Pro w/SP 1 and CD
Custom Owners binder with complete documentation
3 Years Parts & Lifetime Labor Limited Warranty
1 Year Toll Free 24/7 Support & On-Site Service
Meticulous hand wiring and neatly folded cables

$3045

ProMagix™ SX

Intel® Pentium® 4 2.4GHz, 512K Cache
Intel® Certified High Performance Heatsink/Fan
SX Case - Mid Tower, Black with front USB 2.0
MSI® Intel 865PE Series DDR Motherboard
512MB Kingston® PC2700 DDR333 Memory
128MB Matrox® Parhelia™ Triple Head Video
Adobe® After Effects 5.5 Video Effects Bundle
120GB WD 7200rpm Hard Drive, 8MB Cache
Black Pioneer® DVR-05 DVD-RW
Black 1.44MB Floppy Drive
On-Board Integrated 5.1 Sound
Integrated 10/100MBps Network Adapter
8 USB 2.0 ports
Microsoft® Windows® XP Pro w/SP1 and CD
Black Microsoft® Multimedia Keyboard
Black Microsoft® Optical Wheel Mouse
Custom Owners binder with complete documentation
3 Years Parts & Lifetime Labor Limited Warranty
1 Year Toll Free 24/7 Support & On-Site Service
Careful hand wiring and neatly folded cables

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Digital Video Solutions

Velocity Micro offers an extensive array of Matrox digital video systems. Matrox solutions now incorporate the Power of X – a new architecture that leverages the scalable power of your CPU with the explosive performance of dedicated hardware for the ultimate realtime video editing experience.

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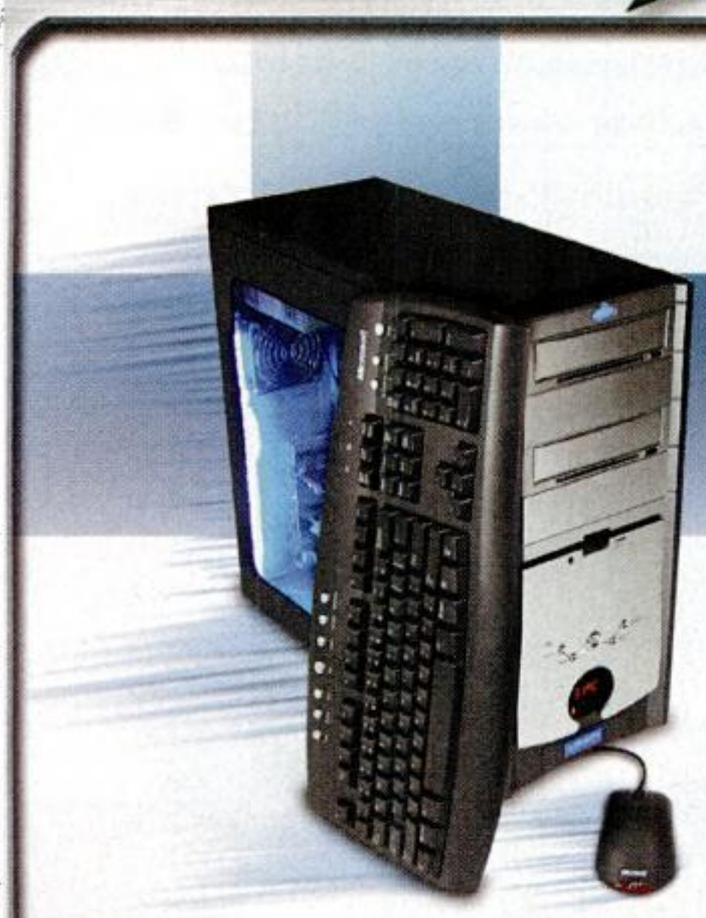

Gamer's Edge™ DX

- Intel® Pentium® 4 3.0GHz, 512K Cache, 800Mhz
- Zalman® Copper CPU Heatsink & Fan System
- DX-W Case - Black & Silver, front USB 2.0 ports
- Asus® P4C800D Motherboard with DDR400
- 512MB Corsair® PC3200 DDR400 Memory
- 128MB ATI® Radeon™ 9800 Pro video
- 200GB WD 7200rpm Hard Drive, 8MB Cache
- Black 52x/24x/52x Lite On® CD-RW
- Black Pioneer® DVR-05 DVD-RW
- Black 1.44MB Floppy Drive
- SoundBlaster® Audigy® 2 Audio Adapter
- 10/100/1000MBps Ethernet Network Adapter
- Black Microsoft® Multimedia Keyboard
- Black Microsoft® Optical USB Scroll Mouse
- Microsoft® Windows® XP Home w/SP 1 and CD
- Custom Owners binder with complete documentation
- 3 Years Parts & Lifetime Labor Limited Warranty
- **1 Year Toll Free 24/7 Support & On-Site Service**
- Meticulous hand wiring with origami folded cables
- Individually Performance Tuned & Optimized

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Vector™ VX

- AMD® Athlon™ 2700+ XP Processor
- Thermaltake™ CPU Heatsink & Cooling System
- VX-W Blue Case - Full Tower with front USB 2.0
- Asus® A7N8X nVidia® nForce2™ Motherboard
- 512MB Kingston® PC2700 DDR333
- 128MB ATI® Radeon™ 9500, 8x AGP Video
- 120GB 7200rpm ATA/100 Hard Drive, 8MB Cache
- Black 16x/48x Lite On® DVD-ROM
- Black 52x/24x/52x Lite On® CD-RW
- Black 1.44MB Floppy Drive
- nVidia 5.1 Channel SoundStorm Audio
- 10/100MBps Ethernet Network Adapter
- Black Microsoft® Multimedia Keyboard
- Black Microsoft® Optical USB Scroll Mouse
- Microsoft® Windows® XP Home w/SP 1 and CD
- Custom Owners binder with complete documentation
- 3 Years Parts & Lifetime Labor Limited Warranty
- **1 Year Toll Free 24/7 Support & On-Site Service**
- Careful hand wiring and neatly folded cables

$1329

NoteMagix™ s56

- Intel® Pentium® 4 3.06GHz, 512K Cache, 533MHz
- Premium Cooling System w/Arctic Silver III
- Intel® 845E+ICH3M Motherboard with DDR
- Exclusive Blast Red Chassis with Front Music DJ
- 15" SXGA+ TFT Active Matrix LCD Display
- 128MB ATI® Mobility Radeon 9000 AGP Video
- 512MB Corsair® PC2100 DDR Memory
- 40GB 5400rpm ATA/100 Hard Drive
- 8x DVD + 24x/10x/24x CD-RW Combo Drive
- 1.44MB Floppy Drive - removable
- S/PDIF Digital output (5.1 CH)
- Integrated 56K V.92 Modem
- Integrated 10/100MBps Network Adapter
- 4 USB 2.0 ports, One 1394 IEEE FireWire
- 8-Cell Smart Li-Ion Battery, 58Wh
- Microsoft® Windows® XP Home w/SP1 and CD
- 1 Year Parts & Lifetime Labor Limited Warranty
- **1 Year Toll Free 24/7 Support & On-Site Service**
- Careful hand assembly and testing
- Fully Performance Tuned & Optimized

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It's our obsession with complete customer satisfaction and attention to details. Our numerous Editor's Choice awards are a testament to our exceptional performance and value, but our 99.4% customer satisfaction rating is our proudest achievement. If you look at the company you want to build your next computer as much as you look at the components inside, you will discover the difference is clear.

Every System is Backed by Advanced 24/7 Toll Free Tech Support and Priority Next Day On-Site Service.

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Best Value, Always!

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Chieftec Server Chasis Blue Model AX-01BLD Retail

$70.00
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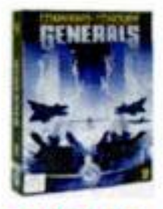

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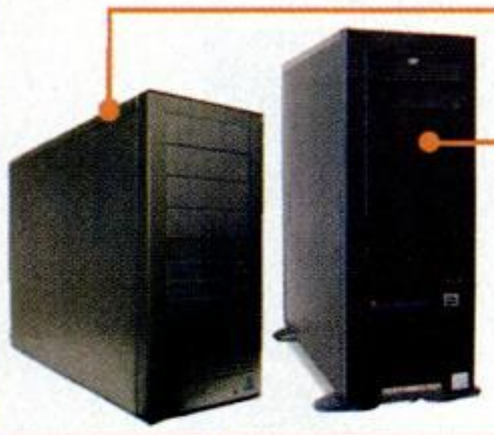

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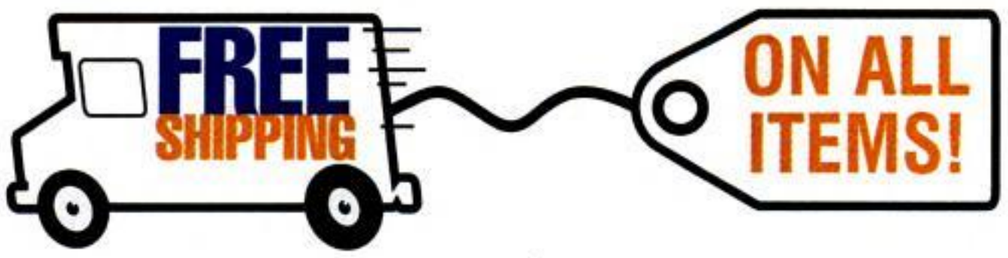

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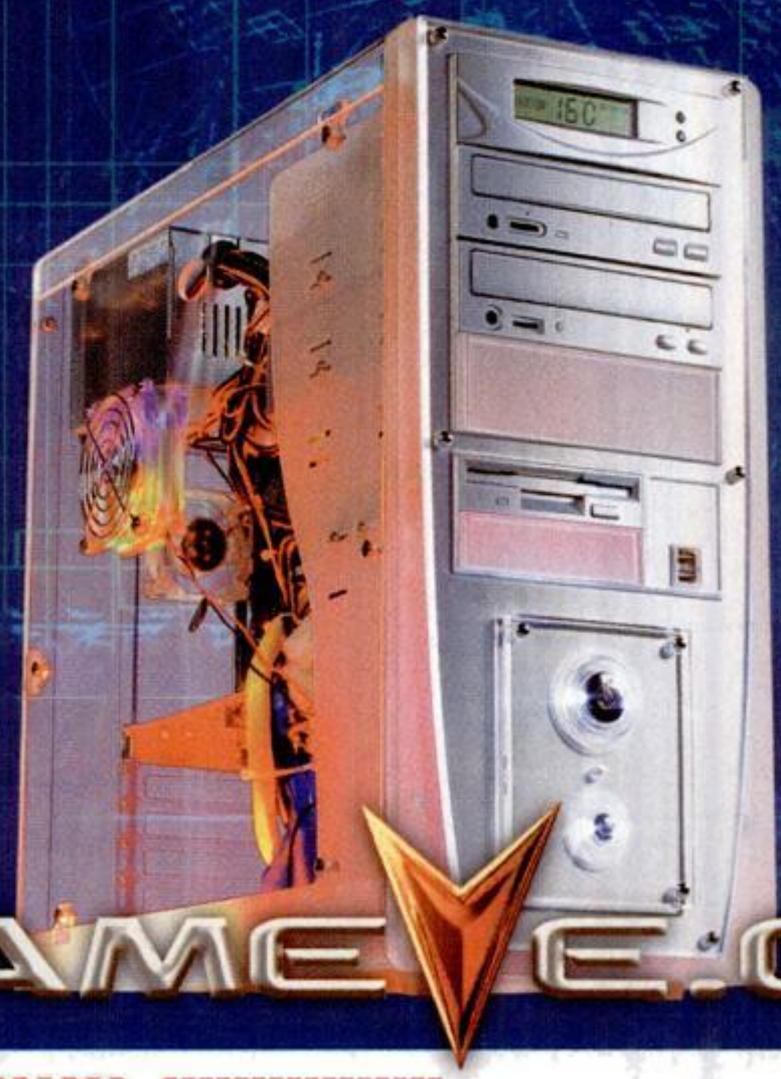

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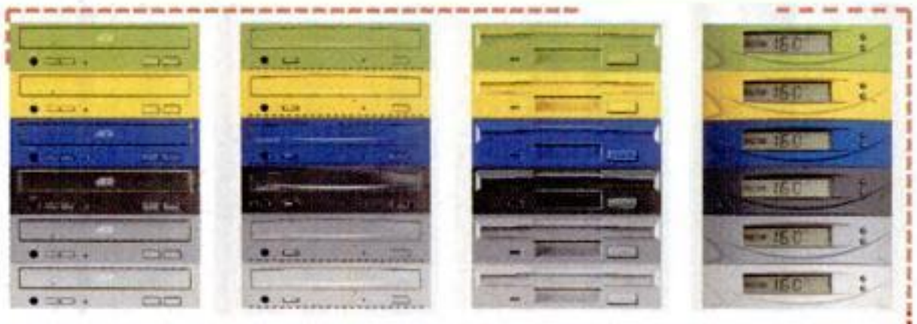

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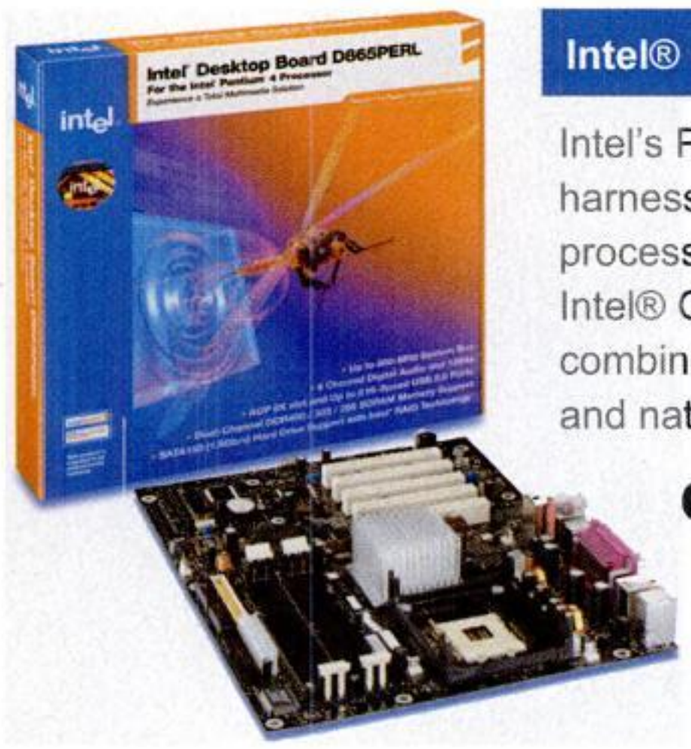

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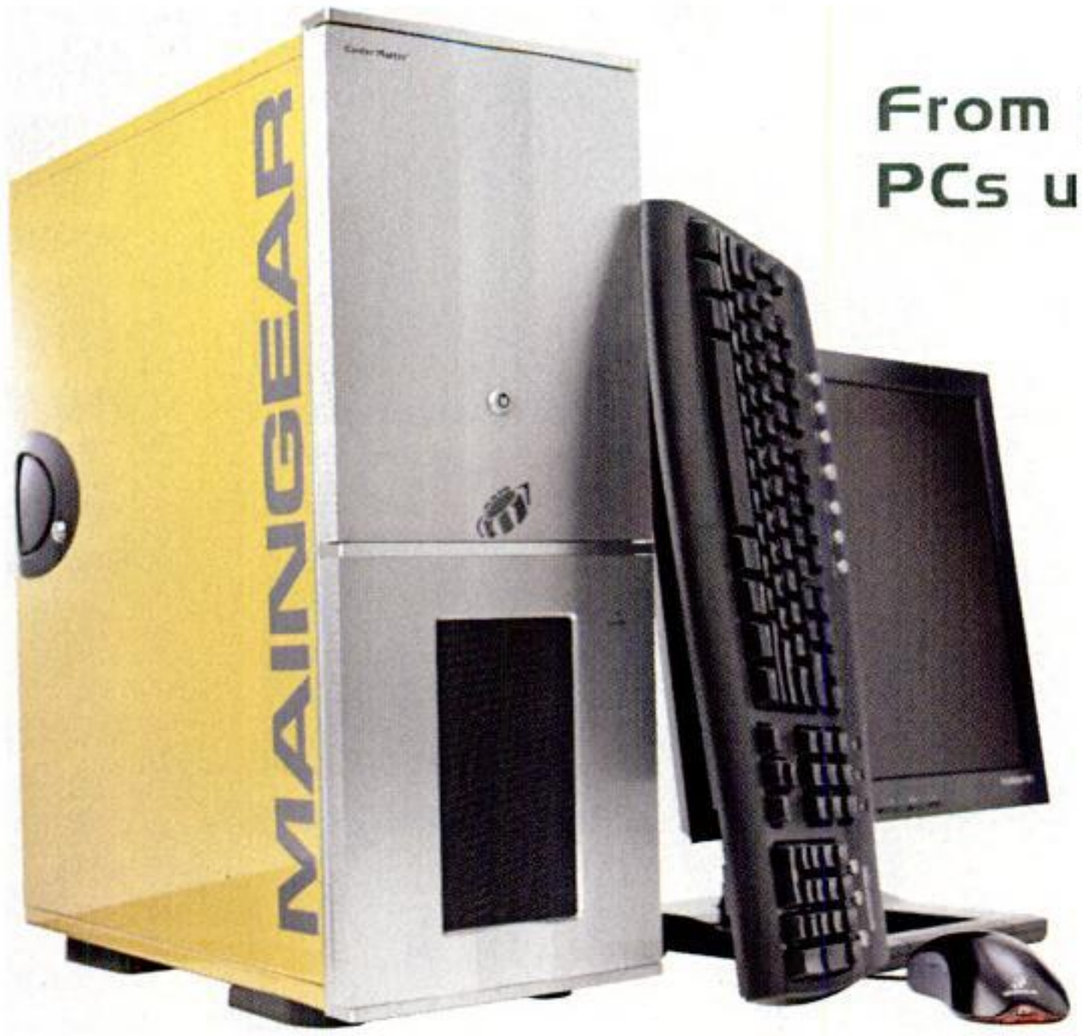

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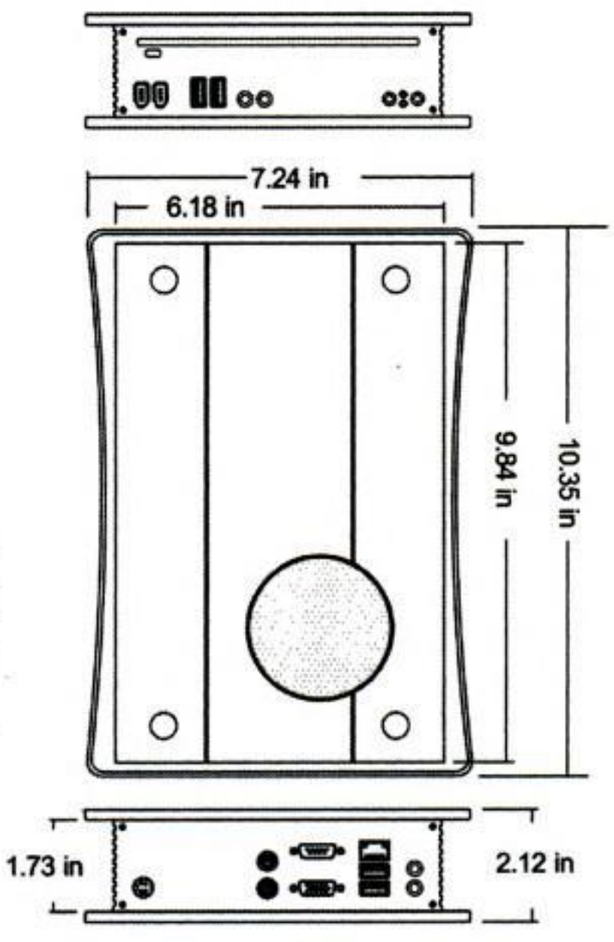

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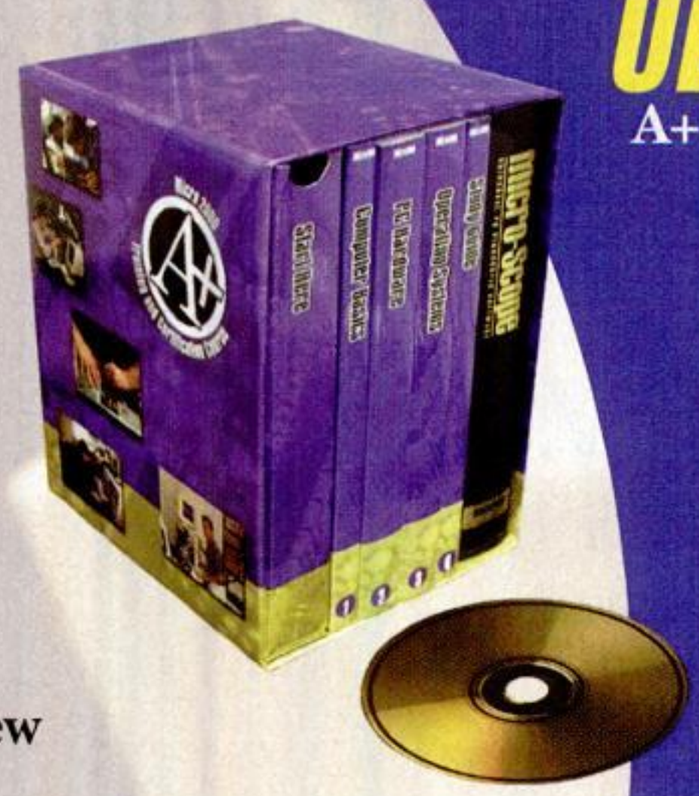

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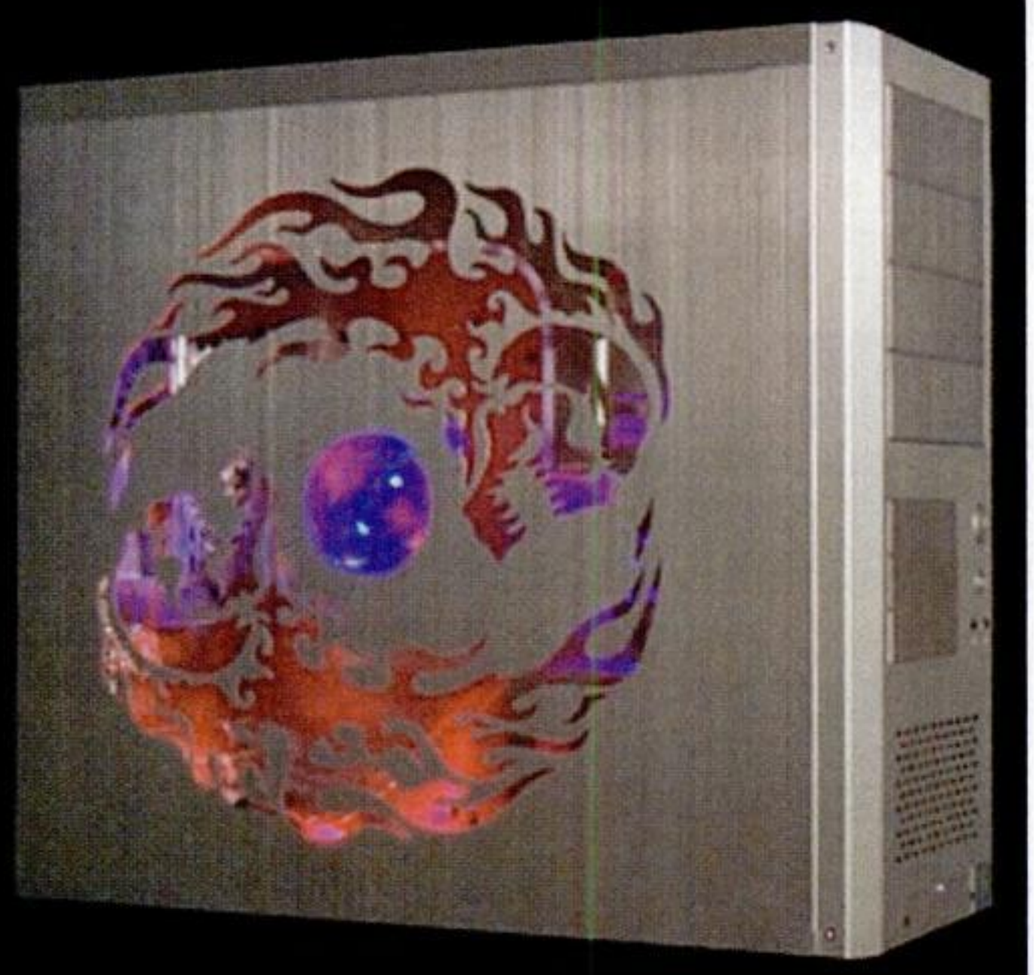

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MAXIMUMPC Rig of the Month

THIS MONTH: Chris Moore's "Iron Chef"

It all started with an Emermax 5190-EL case that was won in a case-modding contest, of all things. Chris Moore took his first-place prize and promptly turned it into yet another mod—the Iron Chef you see pictured here. No it doesn't double as an Easy-Bake Oven (though that's not such a bad idea), but it's nonetheless wholly unique. Not one to just run out and buy the prefabbed fan controllers, switch bays, and LCD modules that would comprise his mod, Chris took on the nitty-gritty himself. As he puts it: "I believe there is more to case modding than just purchasing the items. I wanted this case to include mods that took work on my part, from cutting and painting to custom fabrication of brackets and components." You go, Chris.

He even removed the window that came built into the Enermax and replaced it with one of his own making that accommodates the custom water reservoir he designed to keep the rig cool. He also enlarged all the existing fan holes to suit heftier blowers, and outfitted his hard drive and CD-RW drive with wee windows of their own.

To further illustrate the magnitude of Chris's mod project, consider his comments about the LCD that's built into the case's side: "My attempt to contact Enermax for a replacement side panel was answered with a 'no'... I knew I had only one chance to make it right. This meant careful measuring and cutting." I think we can all agree with him that "after it was all said and done, the LCD came out perfectly."

Chris drilled holes into the knobs of his custom-fabricated fan controller in order to mount blue LEDs, and fashioned its faceplate from Plexiglas. He also created his own LCD display with a VFD module, a hand-crafted mounting bracket, and *LCDC* software for programming.

On one side, a 14.5-inch LCD screen that Chris picked up at a yard sale serves as an embedded second display. On the other, an acrylic window exposes the rig's inner workings.

The Iron Chef is modded from front to back with all manner of goodies that store-bought rigs just don't offer.

Chris removed the multimedia controls that Enermax included at the bottom of the case, and used the space to house his Sound Blaster Audigy breakout box.

So why is it called the Iron Chef? Could have something to do with the fact that when Chris Moore isn't busy with case customization, he is himself a professional chef.

If you have a contender for Rig of the Month, e-mail **input@maximumpc.com** with pics and a brief write-up.

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